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ENVIRONMENTAL ASSESSMENT BOARD



VOLUME: 218

DATE: Thursday, June 21, 1990

BEFORE:

A. KOVEN, Chairman

E. MARTEL, Member

FOR HEARING UPDATES CALL (TOLL-FREE): 1-800-387-8810

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ASSOCIATES
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HEARING ON THE PROPOSAL BY THE MINISTRY OF NATURAL
RESOURCES FOR A CLASS ENVIRONMENTAL ASSESSMENT FOR
TIMBER MANAGEMENT ON CROWN LANDS IN ONTARIO

IN THE MATTER of the Environmental
Assessment Act, R.S.O. 1980, c.140;

- and -

IN THE MATTER of the Class Environmental
Assessment for Timber Management on Crown
Lands in Ontario;

- and -

IN THE MATTER OF a Notice by the
Honourable Jim Bradley, Minister of the
Environment, requiring the Environmental
Assessment Board to hold a hearing with
respect to a Class Environmental
Assessment (No. NR-AA-30) of an
undertaking by the Ministry of Natural
Resources for the activity of timber
management on Crown Lands in Ontario.

Hearing held at the offices of the Ontario
Highway Transport Commission, Britannica
Building, 151 Bloor Street West, 10th Floor,
Toronto, Ontario, on Thursday, June
21st, 1990, commencing at 9:00 a.m.

VOLUME 218

BEFORE:

MRS. ANNE KOVEN
MR. ELIE MARTEL

Chairman
Member

A P P E A R A N C E S

MR. V. FREIDIN, Q.C.)	
MS. C. BLASTORAH)	MINISTRY OF NATURAL
MS. K. MURPHY)	RESOURCES
MR. B. CAMPBELL)	
MS. J. SEABORN)	MINISTRY OF ENVIRONMENT
MS. B. HARVIE)	
MR. R. TUER, Q.C.)	ONTARIO FOREST INDUSTRIES
MR. R. COSMAN)	ASSOCIATION and ONTARIO
MS. E. CRONK)	LUMBER MANUFACTURERS'
MR. P.R. CASSIDY)	ASSOCIATION
MR. H. TURKSTRA	ENVIRONMENTAL ASSESSMENT BOARD
MR. E. HANNA)	ONTARIO FEDERATION OF
DR. T. QUINNEY)	ANGLERS & HUNTERS
MR. D. HUNTER)	NISHNAWBE-ASKI NATION
MS. N. KLEER)	and WINDIGO TRIBAL COUNCIL
MR. J.F. CASTRILLI)	
MS. M. SWENARCHUK)	FORESTS FOR TOMORROW
MR. R. LINDGREN)	
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MR. R. BARNES)	ASSOCIATION
MR. R. EDWARDS)	NORTHERN ONTARIO TOURIST
MR. B. McKERCHER)	OUTFITTERS ASSOCIATION

APPEARANCES: (Cont'd)

MR. L. GREENSPOON)	NORTHWATCH
MS. B. LLOYD)	
MR. J.W. ERICKSON, Q.C.)	RED LAKE-EAR FALLS JOINT
MR. B. BABCOCK)	MUNICIPAL COMMITTEE
MR. D. SCOTT)	NORTHWESTERN ONTARIO
MR. J.S. TAYLOR)	ASSOCIATED CHAMBERS OF COMMERCE
MR. J.W. HARBELL)	GREAT LAKES FOREST
MR. S.M. MAKUCH)	
MR. J. EBBS	ONTARIO PROFESSIONAL FORESTERS ASSOCIATION
MR. D. KING	VENTURE TOURISM ASSOCIATION OF ONTARIO
MR. D. COLBORNE)	GRAND COUNCIL TREATY #3
MS. S.V. BAIR-MUIRHEAD)	
MR. R. REILLY	ONTARIO METIS & ABORIGINAL ASSOCIATION
MR. H. GRAHAM	CANADIAN INSTITUTE OF FORESTRY (CENTRAL ONTARIO SECTION)
MR. G.J. KINLIN	DEPARTMENT OF JUSTICE
MR. S.J. STEPINAC	MINISTRY OF NORTHERN DEVELOPMENT & MINES
MR. M. COATES	ONTARIO FORESTRY ASSOCIATION
MR. P. ODORIZZI	BEARDMORE-LAKE NIPIGON WATCHDOG SOCIETY

APPEARANCES: (Cont'd)

MR. R.L. AXFORD	CANADIAN ASSOCIATION OF SINGLE INDUSTRY TOWNS
MR. M.O. EDWARDS	FORT FRANCES CHAMBER OF COMMERCE
MR. P.D. McCUTCHEON	GEORGE NIXON
MR. C. BRUNETTA	NORTHWESTERN ONTARIO TOURISM ASSOCIATION

I N D E X O F P R O C E E D I N G S

<u>Witness:</u>	<u>Page No.</u>
<u>WILSON EEDY,</u> <u>KARL SCHIEFER,</u> <u>GORDON R. CRAIG, Resumed</u>	39421
Continued Cross-Examination by Ms. Kleer	39421
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I N D E X O F E X H I B I T S

<u>Exhibit No.</u>	<u>Description</u>	<u>Page No.</u>
1263	Excerpts of Report entitled: Environmental Effects of Fenitrothion Use in Forestry, impacts on insect pollinators songbirds & aquatic organisms, published by Pesticides Issues Team, Conservation and Protection, Environment Canada, Atlantic Region, March, 1989.	39424
1264	Hand-drawn Diagram depicting comparison of approved rate and highly unlikely doses of 2,4-D and glyphosate.	39488
1265	MNR Interrogatory Nos. 9 and 12 re OFIA/OLMA Panel No. 9A and answers thereto.	39506
1266	Hand-drawn diagram prepared by Mr. Craig depicting general dose response relationships.	39521
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1268	MOE Interrogatory Nos. 1, 2, 4, 5, 7, 8 & 9 re OFIA/OLMA Panel No. 9A.	39539

1 ---Upon commencing at 9:00 a.m.

2 MADAM CHAIR: Ms. Kleer.

3 WILSON EEDY,
4 KARL SCHIEFER,
5 GORDON R. CRAIG, Resumed

6 MS. KLEER: All right. I'm going to be
7 focussing today on an excerpt from the Environmental
8 Effects of Fenitrothion Use in Forestry. I just wanted
9 to explain, Exhibit 762 which was introduced before
10 contains parts of the same paper. There will be some
11 overlap between this and the other paper, but I thought
12 you should have the whole thing in front of you for
13 purposes of this cross-examination. So at this point
14 I'd like to introduce this because I will be referring
15 to it throughout. (handed)

16 The exhibit which I have just introduced
17 is entitled: Environmental Effects of Fenitrothion Use
18 in Forestry, impacts on insect pollinators songbirds &
19 aquatic organisms, and I'll read the pages that are
20 attached as part of this exhibit.

21 First, the general Table of Contents page
22 (v), then pages 3 through 12 which are Chapter 1, then
23 various excerpts from Chapter 3, page 47, 48, 64
24 through 69, 77 through 81, 91 and 95.

25 I will also be referring to page 64 of
the witness statement, so if you could have that in

1 front of you as well.

2 MR. CRAIG: Excuse me, Ms. Kleer, you
3 mentioned pages 71 to what? I have up to page 69, and
4 then you mentioned page 71.

5 MS. KLEER: No, actually it was 77.

6 MR. CRAIG: 77, yeah. The next page I
7 have is page 95, so I'm missing whatever you require
8 from 69 through 95.

9 MS. KLEER: Oh, I see.

10 MR. CRAIG: I have everything else.

11 MR. FREIDIN: Perhaps the record could
12 also indicate that it's published by Pesticides Issues
13 Team, Conservation and Protection, Environment Canada,
14 Atlantic Region and dated March, 1989.

15 CONTINUED CROSS-EXAMINATION BY MS. KLEER:

16 Q. Will my questions be addressed to
17 you, Mr. Craig, or Dr. Eedy? Who is more familiar with
18 Fenitrothion effects?

19 MR. CRAIG: A. Probably myself.

20 Q. All right. Now, you refer at page 64
21 to the 1989 review paper by Busby et al. That's Busby,
22 Pearce and Mineau; is that right?

23 MR. CASSIDY: 64 of the witness
24 statement?

25 MS. KLEER: 64 of the witness statement,

1 yes.

2 MR. CRAIG: Yes, page 64.

3 MS. KLEER: Q. Yes. My question is:
4 You have referred there to a 1989 review paper by
5 Busby, Pearce and Mineau; is that correct?

6 MR. CRAIG: A. Yes, I have.

7 Q. And the title of that paper is:
8 Fenitrothion effects on forest songbirds, a critical
9 new look.

10 DR. EEDY: A. Actually according to our
11 bibliography there's a White between the Busby and
12 Pearce.

13 Q. All right. That's fine, then.

14 MR. CRAIG: A. Yes.

15 Q. And White is an author of that paper;
16 is that correct?

17 A. That's right, yes.

18 Q. Now, this report is published in a
19 report entitled: Environmental Effects of Fenitrothion
20 Use in Forestry; is that correct?

21 A. Yes.

22 Q. And that report contains a variety of
23 chapters focussing on different issues and this chapter
24 by Busby, White, Pearce and Mineau is just one of
25 those; is that correct?

1 A. That's correct.

2 Q. Now, Chapter 1 of the paper:
3 Environmental Effects of Fenitrothion Use in Forestry
4 gives a synopsis with recommendations; is that correct?

5 A. That's correct.

6 Q. And that synopsis is written by
7 Ernst, Pearce and Pollock; is that correct?

8 A. Correct.

9 Q. So that there is some overlap then
10 between Pearce writing Chapter 3 and Pearce also
11 writing Chapter 1?

12 A. Correct.

13 Q. Okay. You suggest at page 64 that a
14 number of reports cited by Busby, White, Pearce and
15 Mineau have been criticized for lack of statistical
16 rigor and study design.

17 And that criticism is made in Chapter 1
18 of that report at page 6; is that correct? Perhaps you
19 can turn to that in the exhibit.

20 MS. KLEER: Did we give this an exhibit
21 number, by the way?

22 MADAM CHAIR: This will be Exhibit 1263.

23 MS. KLEER: Thank you.

24 ---EXHIBIT NO. 263: Excerpts of Report entitled:
25 Environmental Effects of
Fenitrothion Use in Forestry,

1 impacts on insect pollinators
2 songbirds & aquatic
3 organisms, published by
4 Pesticides Issues Team,
Conservation and Protection,
Environment Canada, Atlantic
Region, March, 1989.

5 MS. KLEER: Q. And I'm referring here to
6 the first paragraph on page 6 of the exhibit.

7 MR. CRAIG: A. Yes.

8 Q. Now, that criticism is made in the
9 same report -- or sorry, in the same paper, Chapter 1,
10 which concludes at page 8 and perhaps you can turn to
11 page 8, that despite that lack of statistical rigor:

12 "...the evidence indicates that
13 fenitrothion poses a considerable risk
14 to...migratory songbirds and casts doubt
15 upon the advisability of broadscale
16 spraying of fenitrothion in forestry."

17 Is that correct?

18 A. It clearly indicates that songbirds
19 would be at risk as a result of spraying.

20 Q. And that is despite the lack of
21 statistical rigor that the authors themselves have
22 noted?

23 A. That's true.

24 Q. Do the authors not also go on to say
25 at page 6, if you can turn back, that:

1 "The lack of statistical rigor in the
2 study design is a recognition of resource
3 constraints and that operational spray
4 priorities took precedence over
5 requirements of environmental study
6 protocols."

7 I'm just reading out of page 6, the top
8 paragraph.

9 A. Yes, that is what it says.

10 Q. Well, would you agree that lack of
11 statistical rigor in general doesn't mean that one
12 should discount the results of the study, but that if
13 there is a trend observed one should go on and further
14 investigate that trend?

15 A. Yes, that's true.

16 Q. So lack of statistical rigor in and
17 of itself is not something to throw away a report for?

18 A. No, it's not to be disregarded.

19 Q. And you also state at page 64 at the
20 bottom paragraph that:

21 "The criteria for establishing negative
22 effects were not clearly developed in the
23 reported studies."

24 Now, is that comment a summary of what
25 was found at page 6 of Exhibit 762, or what we have in

1 front of us, Exhibit 1263, or is that your own comment?

2 A. I think we tried to summarize or
3 capture the overall recognition of limiting statistical
4 rigor and some of the confounding responses and
5 whatnot.

6 Q. Well --

7 A. It's our summary essentially.

8 Q. All right. Let's look at paragraph 2
9 on page 6 of Exhibit 1263, and I'll just read parts of
10 it.

11 A. Mm-hmm.

12 Q. "Secondly, difficulty arises in
13 establishing criteria by which negative
14 effects are judged."

15 And then they go on to say at the very
16 end - and perhaps you will want to review the rest of
17 the paragraph, but I'll just read that final sentence:

18 "In exercising those mandates, the
19 position has been adopted that
20 environmental impacts which result
21 in direct mortality or in the loss of
22 production of wildlife and fish are not
23 acceptable."

24 Would you agree that what the authors are
25 doing is not saying that reported studies themselves

1 did not develop criteria but that they themselves, the
2 authors of this report, are having difficulty in
3 establishing criteria?

4 A. Yes, that's true. They identified
5 that quite often these studies were conducted after the
6 fact and sometimes in an unplanned way and trying to
7 identify and quantify the effects on songbirds is
8 difficult because of the behaviour of the birds and the
9 inability to find birds sometimes. So it's just a very
10 difficult evaluation to conduct, and I think they
11 acknowledge that.

12 Q. But aren't they saying that the
13 difficulty that they have is in establishing criterion,
14 regardless of what the reported study said?

15 A. That's right.

16 Q. Okay. But your study at page 64
17 seems to suggest that the criteria for establishing
18 negative effects weren't developed in the reported
19 studies themselves, when in fact it appears that the
20 authors are saying they themselves had difficulty in
21 developing criteria.

22 A. Oh yes, yes.

23 Q. So is that...

24 A. I acknowledge - I'd say it's six of
25 one and half a dozen of the other. They both had

1 difficulty establishing criteria in the first place
2 and, even having established the criteria, had
3 difficulty quantifying those effects as well.

4 Q. When you say they, do you mean the
5 authors?

6 A. That's right.

7 Q. In the studies or the authors of this
8 overview summary?

9 A. I would say the investigators of the
10 various studies that were conducted, they just
11 acknowledged that it was a very difficult exercise to
12 conduct.

13 Q. Perhaps we can turn to your last
14 sentence on page 64:

15 "Finally, there is acknowledgement that
16 fenitrothion application practices have
17 improved since the early 1970s which can
18 significantly reduce the impact on
19 non-target species."

20 Where do the authors of the report that
21 we have been looking at, Exhibit 1263, acknowledge that
22 fenitrothion application practices have been improved
23 since the 70s which then significantly would reduce
24 impact on non-target species.

25 In other words, is that your own comment

1 or is that something that the authors of the report
2 themselves say?

3 A. Well, we were referring to Exhibit
4 762.

5 Q. Which is at page 6.

6 A. At page 6. I thought that was
7 Exhibit 1263.

8 Q. Exhibit 762 contains the same
9 excerpts as Exhibit 1263 with additional pages.

10 A. You are referring to Chapter 3 of
11 that larger report?

12 Q. No, I'm referring to Chapter 1 at
13 this point at page 6.

14 A. Oh. Well, our reference -- my
15 reference is to 762, Exhibit 762 and I have to refer to
16 that title.

17 I think what we want to identify here,
18 and certainly there is information in Chapter 3 of this
19 larger report, that indicates that particularly the
20 white-throated sparrow study documented effects after
21 two consecutive sprays, for instance, within several
22 days apart, and there is also reference in the other
23 part of the chapter that indicates that fenitrothion
24 was applied fairly regularly in these areas year after
25 year, and that this use rate is no longer at the

1 same -- fenitrothion is no longer being used in the
2 same frequency in effect.

3 Also when we were looking at some of the
4 other studies we were looking at the actual application
5 rates and there is -- it's quite clear that birds can
6 be affected.

7 It then goes to the question as to what
8 the application rates were and how does that compare
9 with the effect rates, and that is why we have
10 indicated that care is required in the application of
11 fenitrothion in order to protect these songbirds.

12 But to my mind a lot of the effects
13 observed could be related to the more frequent use of
14 fenitrothion, and particularly in the same spray period
15 one application several days after another. So it's
16 not just a single application. I think that's where
17 there can be some difficulties.

18 Q. But isn't it true that that's your
19 comment, that's not the comment that the authors of
20 this report make?

21 I see nowhere at page 6 or anywhere in
22 Chapter 1 or in fact in Chapter 3 where the authors of
23 the report themselves say what you have said; i.e.,
24 that they have improved and that will result in -- or
25 can result in a significant reduction in impact of

1 impact on non-target species.

2 What I'm getting at is: Whose conclusion
3 are you stating; is that your conclusion, or is that
4 the conclusion that was reached by the authors of
5 Exhibit 1263?

6 A. Well, in this case it's primarily my
7 conclusion based on the information that we gathered
8 from Chapter 3 primarily, which was the more detailed
9 technical component.

10 Q. So you would agree then that the
11 authors themselves haven't said what you have
12 indicated?

13 A. Well, I viewed their conclusions as
14 one that indicated that if the exposure concentrations
15 exceeded the effect levels there would be indeed a
16 detrimental effect and they've certainly identified
17 that, and that they cautioned against that.

18 Q. I'm sorry, they cautioned against...?

19 A. Against high level use of
20 fenitrothion, and --

21 Q. Well, didn't they go a lot farther
22 than that; didn't they say at page 8 that they
23 recommended that broadscale use of fenitrothion -- they
24 cast doubt upon the advisability of broadscale spraying
25 of fenitrothion in forestry based upon their review?

1 A. Yes, I'd certainly agree that they
2 had concern about that, yes.

3 Q. It's a lot more than concern. Wasn't
4 their recommendation that based on all of that -- the
5 evidence indicates that it poses a considerable risk to
6 protected migratory songbirds and casts doubt on the
7 advisability of broadscale spraying of that insecticide
8 in forestry?

9 A. Yes. I don't see that they're
10 recommending complete prohibition. I think they've
11 indicated that there is considerable risk and there's
12 increased risk and certainly they documented studies
13 where detrimental effects were observed, and so that's
14 what they said.

15 Q. Can you turn with me to page 95 of
16 this exhibit which, for the record, is Chapter -- part
17 of Chapter 3. One of the authors of Chapter 3, as you
18 have indicated, is Dr. Pearce who also wrote Chapter 1
19 or contributed to Chapter 1.

20 Now, at page 95 at the very end there's a
21 statement that says:

22 "Now is an appropriate time to reassess
23 the role that fenitrothion will play in
24 forest protection and to turn collective
25 attention away from that insecticide to

1 more promising alternatives."

2 Now, that seems to be a fairly strong
3 statement that's not just there's risk; would you agree
4 with me?

5 A. Yes, that's true. I also look at the
6 beginning of the preceding paragraph and they indicate
7 that -- they conclude that:

8 "...whereas spraying of fenitrothion in
9 the present use pattern might be
10 acceptable on a small scale as an
11 insecticide of last resort, there are
12 serious doubts about the desirability of
13 such an insecticide..."

14 I think they acknowledge - and this is
15 the flavour that I caught from it - is that
16 fenitrothion would only be considered acceptable as an
17 insecticide of last resort and they are certainly not
18 supporting continuous and regular and annual
19 applications.

20 Certainly I would agree with that, but
21 they certainly recognize that it might be acceptable as
22 an insecticide of last resort, and so --

23 Q. On a small scale?

24 A. Yes, small scale -- that becomes then
25 a value judgment in how and when it's going to be used,

1 but I think they recognize that there is some value to
2 it, but it has to be weighed very carefully and there
3 is that risk of damage, and I don't dispute that.

4 Q. But don't they then go on to say,
5 they should reassess the role fenitrothion will play
6 and turn collective attention away from that
7 insecticide?

8 A. Yes, that's their implication for
9 fenitrothion.

10 Q. All right. I take it you -- part of
11 your area of expertise is not surveying songbirds; is
12 that correct?

13 A. True.

14 Q. Now, would you agree that one of the
15 areas of concern that's addressed in Chapter 3 of this
16 study is that there are methodological biases which
17 consistently result in underestimation of exposure and
18 impact? Is that part of Chapter 3?

19 A. Yes. That's true, yes.

20 Q. Well, perhaps we can turn to 3.6 in
21 Exhibit 1263 which begins at page 64, and I would like
22 to look more closely at that.

23 Now, at page 64 with respect to carcass
24 searches did the authors conclude that carcass searches
25 as a research technique are biased downward by such

1 things as scavenging, detectability and predation prior
2 to death?

3 A. That's true.

4 Q. Is that an opinion that you agree
5 with?

6 MR. CASSIDY: Well, I don't know whether
7 he's in a position to answer that in light of his
8 statement earlier that he said he's not an expert in
9 surveying songbirds, and I think we'd better
10 clarification on whether that extends to this type of
11 evidence.

12 MR. CRAIG: I have had no experience
13 concerning songbirds or looking for carcasses or any
14 retrieval methods. I have read what is in this section
15 of the report, but I'd have to bow to their expertise.
16 I don't have equivalent experience in this area.

17 MS. KLEER: Q. All right. Let's turn
18 back to page 95 for a moment, and we will look at the
19 fourth paragraph on the left side and I'll read it into
20 the record:

21 "One of the most disturbing aspects of
22 all the evidence gathered to date is
23 that, as repeatedly discussed in this
24 review, most methodological biases
25 consistently result in underestimation

1 of exposure and impact. That may not be
2 a concern of fenitrothion use was
3 occasional and small scale. The problems
4 specific to large insect control
5 programs, which strive to deliver a
6 chemical to large areas within a short
7 period of time, make risk assessment even
8 more complex."

9 So what you're saying is that you can't
10 comment on any portion of methodological biases because
11 of your lack of experience in that area?

12 MR. CRAIG: A. Well, I understand what
13 they're saying and I can understand why they're saying
14 what they're saying, but what I'm also saying is that I
15 can't comment on the support or non-support of success
16 of that technique based on my non-existent experience.

17 I can only agree that they've had these
18 difficulties and they can't generate the kind of data
19 that they would like, and I understand the statistics
20 of data generation and the need for that kind of
21 database in order to draw concrete conclusions, and I
22 can appreciate the limitations that they experienced by
23 not being able to generate the database that they need,
24 so...

25 MR. CASSIDY: And I would advise Ms.

1 Kleer and the Board that it will be my client's
2 position that this witness has not adopted that and,
3 therefore -- because he does not have the expertise
4 and, therefore, it would be encumbent upon her or any
5 other party who wishes to establishes that
6 underestimation to put in evidence of their own to
7 establish that fact, since it's not been done through
8 the mouth of this witness.

9 MS. KLEER: Q. Dr. Eedy, is this
10 something that you have experience in?

11 DR. EEDY: A. I really have not. I
12 presume what you're getting at is that if you went out
13 and tried to count the bodies of birds on the forest
14 floor that some of these may have been eaten by
15 predators or something like that.

16 Q. But you're not --

17 A. I'm not so sure about that exact
18 paper anyway, I haven't read the whole paper.

19 Q. Are you an expert on brain
20 cholinesterase activity?

21 A. I know what it means or have done
22 work associated with cholinesterase activity, yes.

23 Q. So you have actually --

24 A. I feel confident in discussing
25 cholinesterase activity and fenitrothion poisoning.

1 Q. Now, brain cholinesterase inhibition
2 has been one of the key areas and one of the most
3 controversial areas studied with respect to
4 fenitrothion on songbirds; is that correct?

5 A. I think the laboratory work that was
6 conducted was very clear, that increased exposure would
7 reduce the cholinesterase activity in birds.

8 Q. There have also been field studies as
9 well though?

10 A. I think the difficulty had been to
11 connect the reduction of cholinesterase activity in
12 exposed birds to effects in the field. I think that is
13 the relationship that has been difficult to develop.

14 Q. But do they not -- have they not
15 performed field studies where they spray an area and
16 then they go and collect birds--

17 A. That's true.

18 Q. --and monitor for brain
19 cholinesterase?

20 A. That's quite right.

21 Q. Now, your review doesn't deal with
22 the controversies that surround this area; is that
23 correct?

24 A. No, we didn't. We did not, no.

25 MADAM CHAIR: Excuse me, Mr. Craig. The

1 Board has received evidence a very long time ago about
2 the Busby study, and I thought at that point we had
3 received some evidence to the effect that in order to
4 test the brain cholinesterase you had to kill the
5 songbirds.

6 MR. CRAIG: That's true.

7 MADAM CHAIR: And I think at that point
8 one of the issues that was discussed was how
9 large-scale these experiments could legitimately be
10 undertaken.

11 MR. CRAIG: Madam Chair, from what I've
12 read I understand that some dead birds were collected
13 and one of the difficulties there is that the
14 cholinesterase activity decreases even further and,
15 therefore, you get increased error in measurement just
16 because the animal is moribund or dead.

17 MADAM CHAIR: Yes.

18 MR. CRAIG: So the tissue is less vital
19 and that is a problem, and part of the difficulties in
20 that laboratory to field relationship, in developing
21 that relationship.

22 MS. KLEER: Q. Are you familiar with the
23 work of Mineau and Peakall that's referred to at page
24 77 of this Exhibit 1263, that the magnitude of
25 cholinesterase depression may be underestimated by

1 including birds that are not yet affected or birds
2 recovering from cholinesterase exposure?

3 MR. CRAIG: A. Yes, I'm familiar with
4 that argument, yes.

5 Q. Is that in your opinion a real
6 collection bias?

7 A. Yes, it would be just because of the
8 dynamics of the response because the animals can
9 recover from cholinesterase inhibition, and as they
10 recover, of course, that inhibition level will return
11 to normal and the effect will be considered to be less
12 if one measured at different times after -- and longer
13 periods of time after exposure.

14 Q. So do you agree then that even if
15 birds are collected with cholinesterase inhibition
16 levels, despite the problems that exist when doing
17 these kinds of studies, and the level of cholinesterase
18 inhibition is something less than 50 per cent, and you
19 don't see any behavioural effects or you don't see any
20 reproductive effects, that that in itself does not tell
21 you that there may not be behavioural or reproductive
22 effects, negative effects that you can't monitor
23 because of the birds that you collect?

24 A. I'm not -- I didn't quite follow you
25 in your logical progression. Perhaps you could go over

1 a bit at a time.

2 Q. All right. Well, you admitted that
3 there is a collection bias.

4 A. Yes.

5 Q. Okay. Now, given that collection
6 bias you're not going to collect all the birds that
7 have the greatest level of brain cholinesterase
8 inhibition; is that correct?

9 A. Well, no, absolutely not, you aren't
10 going to collect all of the animals that you want in
11 any case. There is a difficulty collecting animals,
12 firstly.

13 Q. All right. And if a bird were very
14 affected--

15 A. Yes.

16 Q. --with a high level of brain
17 cholinesterase inhibition, is it true that observed
18 effects in the lab indicate that they stay back, they
19 retreat to corners, that they don't move essentially?

20 A. I think those were some of the field
21 exercises they conducted.

22 Q. Okay. So in the field that they've--

23 A. Yeah. And there were some
24 behavioural changes noted in laboratory exposures as
25 well.

1 Q. I'd like to turn to page 64 of the
2 witness statement, to your fourth paragraph, and I'll
3 read it into the record:

4 "Many of the bird species studied by
5 Spray et al...", in a 1987 report, "...
6 in Scotland, are similar to or related to
7 species found in Ontario forests. On the
8 basis of the Busby et al...", which you
9 reviewed earlier in your witness statement, "...and the
10 Spray et al. studies, it appears that
11 fenitrothion use in Ontario in accordance
12 with authorized procedures will not
13 result in exposure concentrations that
14 will adversely affect songbird foraging,
15 nesting, rearing or Territorial
16 behaviour."

17 Now, you've only reviewed two studies to
18 reach that conclusion. There are a lot of other
19 studies out there; is that correct?

20 A. Yes, I suppose we've certainly seen
21 in Chapter 3 there are a lot of other references, yes.

22 Q. Well, how can you make that -- that's
23 a very broad based statement or a broad opinion to
24 reach based upon just two studies; would you agree?

25 A. Well, we looked at the studies that

1 would contain some clear indications of application
2 rates and effects and that was one of the things that
3 we were trying to focus on, and we realized that
4 clearly fenitrothion at higher than threshold effect
5 levels would indeed have an effect on songbirds and
6 that some of the studies reported did indeed exceed
7 that threshold and, therefore, it was not surprising to
8 see those effects.

9 So we wanted to then focus on studies
10 that dealt more closely with the approved type rates
11 and we found that the approved rates are virtually at
12 that threshold of effect, and so that's why we arrived
13 at that conclusion, that the threshold effect
14 information that we had coincided with the approved
15 rates.

16 I think we wanted to identify that
17 there's -- that the application rate is indeed close to
18 that effect and requires clear application and
19 certainly we agree with conclusions that fenitrothion
20 would be an insecticide of last resort. I think that's
21 what they mean; isn't it?

22 Q. On a small scale.

23 A. Yeah. Well, they also mentioned a
24 small scale, but that to arrive at that situation, to
25 my mind, would require a number of value judgments to

1 determine whether or not one would proceed with that.

2 We're saying based on the toxicology data
3 that we have the approved rate is very close to that
4 threshold effect level, therefore, it requires special
5 care and attention in its application.

6 Q. Now, you've referred then to these
7 two studies to reach your conclusion. Are there other
8 studies that you did not refer to to reach your
9 conclusion that also relied upon typically applied
10 rates of fenitrothion?

11 Are you saying that these two are the
12 only two studies that exist?

13 A. We felt these two were the most
14 relevant. Now, there is always a lot of literature out
15 there. There might be some more studies, but these two
16 we felt were relevant and important to arriving at the
17 conclusion that we did arrive at.

18 MADAM CHAIR: Excuse me, Mr. Craig. With
19 respect to this conclusion of using fenitrothion
20 carefully in some way, that conclusion is reached
21 solely on the basis of its effects on songbirds or its
22 potential effects on songbirds?

23 MR. CRAIG: No, with regard to songbirds
24 there is a limitation, a recognized limitation.

25 MADAM CHAIR: Are there areas of the

1 undertaking where you don't have songbirds?

2 MR. CRAIG: I would doubt it. I don't
3 know.

4 MR. CASSIDY: Maybe Dr. Eedy...

5 DR. EEDY: No, I think you'd have
6 songbirds pretty well throughout the undertaking,
7 different species and different numbers, that sort of
8 thing.

9 MADAM CHAIR: Generally songbirds are
10 affected by fenitrothion regardless of the type of
11 songbird as...

12 MR. CRAIG: Different species would have
13 different sensitivities, Madam Chair, but I think in
14 the cases of these studies the focus would be on the
15 more sensitive species. I mean, obviously effects were
16 observed and in that broadscale community response,
17 obviously the more sensitive species would be the first
18 to respond.

19 So, yes, there are different
20 sensitivities among species and in reported studies
21 where there were applications and no detrimental
22 effects observed, then I would suggest that even the
23 less sensitive species were not responding as well as
24 one could determine.

25 MADAM CHAIR: With respect to what you

1 just said about the approved application rates being
2 close to a threshold--

3 MR. CRAIG: Yes.

4 MADAM CHAIR: --or providing a threshold
5 effect--

6 MR. CRAIG: Yes.

7 MADAM CHAIR: --you still believe that
8 there are ways in which fenitrothion could be applied
9 with some safety to songbird populations?

10 MR. CRAIG: I don't know that I can
11 comment on the methods of application. What I would
12 say from a toxicological perspective is that it would
13 be important to not use any more fenitrothion in the
14 application than was necessary to do the job and,
15 obviously, fenitrothion would be used in -- to combat
16 an insect infestation and I would think that this would
17 be a major threat -- this infestation would be a major
18 threat to the wood resource and, therefore, a decision
19 would be underway in order to decide how to combat that
20 infestation.

21 And what I'm saying is, in the
22 application of fenitrothion, if that were the
23 insecticide of choice for this particular set of
24 circumstances, that the threshold response of in this
25 case songbirds is very close to the approved

1 application rate and that there is very little margin
2 for error.

3 MR. MARTEL: Is that coincidental that
4 one is close to the other, or...

5 MR. CRAIG: I don't know if it's
6 coincidental I guess in the grand plan of the world. I
7 don't know, I think that's just the way it is. That's
8 just the where the sensitivity of certain songbirds
9 falls and it's close to that application concentration.

10 So I don't want to stray into other
11 areas, but it seems to me that there would arrive a set
12 of circumstances that many considerations would have to
13 be brought to bear as to what would be used and how and
14 when and where, and songbirds are sensitive to
15 fenitrothion and there is not a great deal of margin
16 for error in its application.

17 MS. KLEER: Q. Now, you've said that you
18 can't comment on methods of application; is that
19 correct?

20 MR. CRAIG: A. I have no idea how -- the
21 way it is done.

22 Q. All right. Do you have any expertise
23 at all in the area of how far the pesticide will
24 migrate, depending upon the type of application method,
25 out of the area which is intended to be sprayed?

1 MR. CASSIDY: Well, that was the subject
2 of the last Panel 8 I believe, the previous Industry
3 panel on pesticides which Ms. Cronk handled.

4 My understanding is that panel dealt with
5 whole question of efficacy, effect, et cetera. Drs.
6 Carrow and MacCormack were present, so I am not sure
7 this is the proper panel for that question to be
8 raised.

9 MS. KLEER: Well, I'm afraid that we must
10 look at the comments that are made by Mr. Craig at page
11 82 with respect to buffer zones.

12 Q. And if you will turn to that in the
13 witness statement you have concluded at page 82 at the
14 bottom there that:

15 "The spray buffer zones and other
16 conditions imposed with Ontario permits
17 for pesticide spraying given the general
18 amount of persistence of the pesticides
19 in use are adequate to minimize both
20 transported pesticides out of spray areas
21 and non-target effects inside spray
22 areas."

23 Well, isn't that a comment about the
24 validity and the worth of the buffer zone?

25 MR. CRAIG: A. Yes, that is a comment on

1 the buffer zones, yeah.

2 Q. Well, do you feel qualified to make
3 those kind of comments, given your lack of familiarity
4 with application methods?

5 A. Yeah. What I was referring to in the
6 case of the buffer zones was whether or not the buffer
7 zones would offer by necessity an additional level of
8 protection, particularly in the areas of aquatic
9 resources in this case. Well, that was one of several
10 cases, but that is where I would see buffer zones.

11 Obviously from other discussions buffer
12 zones - and in this document - buffer zones are
13 identified in the context of aquatic needs primarily is
14 my understanding and, therefore, with regard to
15 insecticides we have discussed the needs of buffer
16 zones and by and large we've indicated that it is not
17 essential to have buffer zones alongside of receiving
18 waters in case of insecticides, buffer zones would
19 provide additional safety into what is over and above
20 what is already available as a dilution effect in the
21 receiving waters.

22 But that's not to say that buffer zones
23 are not required for other reasons and, as Dr. Schiefer
24 has indicated from the fish habitat perspective, buffer
25 zones would be required.

1 Q. But can you comment on what size of
2 buffer zone would be required given that you do not
3 have any familiarity with application methods, so you
4 don't know how far it will go?

5 A. What I'm saying is that provided
6 that -- if the insecticide in this case can be kept
7 from the edge of the receiving water; that is, outside
8 of the receiving water area, no further protection is
9 required because there is a degree of protection
10 available in receiving waters through dilution.

11 So on that basis I would say that buffer
12 zones are not an essential component to insecticide
13 applications and, therefore, if a buffer zone is
14 required for any other reason, then that only provides
15 additional reduction of risk of exposure. That's all
16 I'm saying. So it doesn't matter from my perspective
17 how many metres, feet or centimetres are offered for
18 other reasons. And once again, I would say it would be
19 valuable from the perspective of applications to limit
20 entry of insecticides into water.

21 So it doesn't matter to me how the
22 insecticide is applied, it's not an area that I know
23 anything about. I haven't got -- I've got no idea.

24 MADAM CHAIR: So is your comment only
25 with respect to the protection of the aquatic resource?

1 MR. CRAIG: In general, yes, that's where
2 a lot of my focus have been, although we also discussed
3 direct and indirect effects on mammalian species that
4 would be in the timber area, and there are other
5 considerations there.

6 In the case of songbirds, for instance,
7 we have said there is -- and fenitrothion, there is
8 that risk that if the application exceeds approved
9 rates there is a sensitivity.

10 MS. KLEER: Q. Mr. Craig, given your
11 comments about your lack of familiarity with
12 application rates, are you saying at paragraph 8 on
13 page 82 that Ontario's spray buffer zones are adequate,
14 or are you just saying that buffer zones in general are
15 adequate?

16 A. Buffer zones that have been proposed
17 are adequate to protect the aquatic resources from my
18 perspective.

19 Q. But how can you say that if you don't
20 know how far it might drift outside of a buffer zone --
21 sorry, outside of the intended spray block?

22 A. Well, I'm also saying that the size
23 of the buffer zone is providing additional -- any size
24 of buffer zone is providing additional risk from
25 exposure of the aquatic system.

1 So given that there is a need for buffer
2 zones for other reasons, for instance fish habitat
3 protection, I would say really I have little -- I have
4 no other need of buffer zones, I have no need for
5 buffer zones from the insecticide perspective. They
6 may be needed for something else but not for
7 insecticide protection of receiving waters. That's
8 what I'm saying.

9 MR. MARTEL: What about surface waters?
10 Let's say people in the woods, they use -- they drink
11 directly from a body of water that without their
12 knowledge has been sprayed.

13 MR. CRAIG: Yes.

14 MR. MARTEL: Is there a possibility of
15 effect on people?

16 MR. CRAIG: Well --

17 MR. MARTEL: Or does it dilute so quickly
18 that...

19 MR. CRAIG: I'd have to compare human
20 toxicology data with concentrations, but let me say
21 from other experience on other toxicants, if a toxicant
22 present in water is safe for fish it's safe for people,
23 because in the development of Water Quality Guidelines
24 for the Province of Ontario and for the International
25 Joint Commission - and I'm involved in both of those

1 exercise - humans are typically much more tolerant of
2 any toxicant that would be in water than are aquatic
3 orders, much more tolerant.

4 So if fish and invertebrates can survive
5 exposures, then it would be too much less of a drinking
6 water limitation.

7 MS. KLEER: Q. Mr. Craig, your comment
8 at page 82 about buffer zones and their adequacy to
9 minimize transport out of spray areas and non-target
10 effects, does that relate at all to the buffer zones
11 around human habitation, or are you simply limiting
12 your comment to buffer zones that are put around water
13 bodies?

14 MR. CRAIG: A. I was focusing on water
15 bodies primarily in this regard.

16 Q. Now, there's been a lot of focus on
17 the level of application and how that affects the types
18 of effects that you expect to find in the field.

19 Are you aware of any studies which
20 document over a broad area that has been sprayed what
21 the actual level of deposit of the pesticide is in a
22 variety of areas across the area that has been sprayed?

23 A. I'm not readily apparent of that. I
24 think I know what you mean.

25 Q. Wouldn't that be important

1 information to have though to determine what level of
2 effect you could expect, because even though you had an
3 application rate of 210 grams per hectare--

4 A. Yes.

5 Q. --that may not, on the forest canopy
6 or on the ground, result in an even rate of deposit, it
7 might be heavier in one area and lighter in another
8 area. Is that something that you could comment on?

9 A. Well, again it goes to, I think, the
10 methods and techniques of application and the success
11 of various application techniques on delivering the
12 product and that is not an area that I have any
13 familiarity with.

14 I've been focusing my attention on, given
15 an application rate reported in the studies and
16 measured in the environment, either water -- well,
17 primarily in water in the cases that I focused on, but
18 I have relied on the reported application rates and, in
19 some cases, measured concentrations in the field.

20 I view the method of application and the
21 successfulness of delivering that application in the
22 field as somewhat a separate area of expertise and that
23 is not anything I'm familiar with as to what that
24 success would be.

25 Q. Okay. But it would be important for

1 you, from a toxicological effect perspective, to know
2 what level of application resulted on the ground?

3 A. Oh yes, I think that's critical to
4 know.

5 Q. All right.

6 A. There's a confirmation procedure I
7 think inherent in the...

8 Q. Sorry, a...?

9 A. A confirmation. I think you need to
10 know what the concentrations are in the area delivered,
11 so that's what I've used to estimate the effects.

12 Q. I have know further questions. Thank
13 you very much.

14 MS. KLEER: Thank you very much.

15 MADAM CHAIR: Thank you, Ms. Kleer.

16 Mr. Freidin?

17 MR. FREIDIN: I need a few minutes to
18 move my stuff.

19 MADAM CHAIR: Mr. Cassidy, I just found a
20 design flaw in the binders. We've labeled the front --
21 we've labeled the plastic sleeve with the number, but
22 all my pictures fell out. I don't have any numbers on
23 them.

24 MR. CASSIDY: I'll be sure to advise Ms.
25 Cronk who devised that design and inform her that at

1 the next hearing we're going to have to change the
2 design.

3 Would you require our assistance in
4 getting it reorganized? We'd be pleased to do that.

5 MADAM CHAIR: No. Mr. Martel's binder is
6 in perfect condition, so we'll just match.

7 MR. CASSIDY: I hope that doesn't reflect
8 their use.

9 MADAM CHAIR: I won't tell you what I've
10 been using this for.

11 MR. MARTEL: Mine hasn't been used for a
12 doorstop.

13 MR. CASSIDY: If at any time we can be of
14 assistance in organizing those, Madam Chair, don't
15 hesitate to ask.

16 MADAM CHAIR: I think we can handle it.
17 Thanks, Mr. Cassidy.

18 MR. CASSIDY: All right.

19 CROSS-EXAMINATION BY MR. FREIDIN:

20 Q. Okay, Mr. Craig, I think I'll start
21 with you. You made the comment in your evidence that
22 in relation to B.t. that it doesn't degrade like a
23 chemical, it is a ubiquitous material and under ideal
24 conditions can persist for a long time.

25 Can you establish what you mean by it

1 being ubiquitous and why it is ubiquitous?

2 MR. CRAIG: A. I have indicated it was
3 ubiquitous in that members of that -- or that bacteria
4 can be found in the environment in general, albeit at
5 typical low concentrations. I don't know what those
6 concentrations would be, but I would anticipate that
7 they would be at some very low detectable level, some
8 very low background level and, obviously, the
9 application of that agent as an insecticide is
10 conducted to increase that level of concentration so
11 that it becomes insecticide active agent.

12 So that is what I mean, and I would
13 anticipate that after it would kind of drop back down
14 to that background level.

15 Q. You also said that under ideal
16 conditions it can persist for a long time. Were you
17 talking about the persisting at a long time at the
18 application rate or sort of at its natural level?

19 A. I would -- what I mean is that it
20 would be -- that under ideal conditions, and that those
21 conditions would be temperature dependent, moisture
22 dependent and nutrient dependent, and that levels of
23 B.t. could be measured at a higher than background
24 concentration and there will be some concentration
25 between background at a low level and the higher

1 application concentration, I would expect some general
2 dilution through time from the application
3 concentration.

4 Q. Does sunlight have an effect on B.t.
5 concentrations?

6 A. I don't recall offhand.

7 Q. In other words, if you apply it as an
8 insecticide, it is my information that sunlight will in
9 fact cause there to be a reduction in the
10 concentration. Are you able to confirm my information
11 as being correct?

12 A. Mr. Freidin, I can't confirm that
13 specifically, but I do know that ultraviolet radiation
14 is a disinfecting technique, it does kill bacteria;
15 b.t. are bacteria and ultraviolet light is available in
16 the open field. I would suggest that that would
17 have -- that could be a cause of degradation.

18 Q. Thank you.

19 A. I can't confirm that specifically.

20 Q. All right. Could you refer to page
21 78 of the witness statement, please.

22 A. Yes.

23 Q. Item No. 1, states:

24 "The bacterial insecticide B.t.k. is
25 innocuous to most aquatic invertebrates."

1 A. Yes.

2 Q. Can you confirm for me that B.t.k. is
3 the only variety of B.t. which is applied for forestry
4 purposes in Ontario?

5 A. That is my understanding, yes.

6 Q. And am I correct that B.t.i., which
7 is not used for forestry purposes, can affect
8 mosquitoes and black fly larvae.

9 A. That's also my understanding, yes.

10 Q. That B.t.k. which is used for
11 forestry purposes does not have a similar effect?

12 A. Yes, that's also my understanding.

13 Q. Now, the evidence in the hearing, Mr.
14 Craig, to date is that 2,4-D can be used two or three
15 times on the same area over a rotation of a particular
16 area over a particular area. What is the half-life of
17 2,4-D?

18 A. Well, we've identified that 2,4-D has
19 a half-life or 50 per cent of it will disappear in a
20 variety of time, we mentioned from days to several
21 weeks in general, and that really depends on the medium
22 that is being monitored or -- the medium that's being
23 monitored, we measured air, soil and water.

24 Typically increased temperature,
25 increased humidity or moisture content in soils as well

1 as bacterial communities that will use the -- will
2 break down the 2,4-D will go to reducing the
3 concentration of that 50 per cent point.

4 So that's our conclusion from the
5 literature we've reviewed, and typically it's from days
6 to weeks.

7 Q. If you apply -- if you have three
8 applications of that insecticide, and let's assume now
9 that they're one year apart as opposed to be spread out
10 over a rotation of the forest--

11 A. Yes.

12 Q. --would there be a basis for a
13 concern re additive effect in those circumstances?

14 A. No. I would anticipate by the next
15 application; that is, one year after a previous
16 application, that with a 50 per cent reduction of
17 several weeks, for instance, there would be adequate
18 time for 2,4-D to reach non-detectable levels at the
19 next spraying application.

20 Q. Thank you. Can you turn to page 22
21 of the witness statement, and I refer you to the
22 section entitled: Environmental Persistence.

23 A. Yes.

24 Q. And you may recall Mr. Castrilli
25 asked you some questions about the second sentence

1 which says:

2 "In other words, a compound...", and he
3 was talking -- that led to some questions about
4 synergistic effects, you defined synergistic effect in
5 your evidence and contrasted that with an additive
6 effect.

7 Are you aware of any evidence that there
8 are adverse synergistic effects from glyphosate and
9 2,4-D being applied in the same area?

10 A. I'm not aware of synergistic
11 interactions.

12 Q. With the half-life of 2,4-D and
13 glyphosate, is there any time period within which the
14 two compounds would have to be applied to be concerned
15 about a possible synergistic effect?

16 You indicated you're not aware of there
17 being one, I'm asking a hypothetical question: Based
18 on your knowledge of what the half-life of those two
19 chemicals are, is there any time period within which
20 those two compounds would have to be applied in the
21 same area for you to have a concern about even a
22 possible synergistic effect?

23 A. I'm not aware of specific evidence,
24 but I would anticipate that if the time period between
25 applications were equal to two half-lives that any

1 combined effect would not exceed the effect by either
2 one of the individuals at the time of the original
3 application of one or the other. I don't know, that
4 may not be very clear.

5 Q. That's clear to me and that's fine.
6 Thank you.

7 MR. MARTEL: Do you want to run that one
8 by me again.

9 MR. FREIDIN: That is...

10 MR. CRAIG: At time zero when the
11 herbicide is applied there would be a natural decay of
12 concentration and if a second herbicide were applied at
13 some point after and there were also a natural decay,
14 if the second herbicide application was at least two
15 half-lives after the first - so that would mean that
16 the residual should be something around 25 per cent, so
17 it would go from a hundred to 50, half of that again
18 would be 25 per cent of the original - then the second
19 herbicide would appear at the hundred per cent
20 application rate and it would start to decline at the
21 same time as the first was declining.

22 So that any interaction I would say could
23 be assumed to be additive; that is, whatever the
24 residual effect - if there is any at that stage because
25 it may be below the effect concentration - but any

1 additive effect from the first would be minimal in
2 addition to the second and, of course, it would start
3 declining.

4 So as the first declined past --
5 approached and passed the threshold level, it would
6 have less additive effect and maybe even no additive
7 effect - I'm speaking on a theoretical basis - to the
8 application of the second herbicide which also begins
9 its decay period.

10 That is why I would suggest that
11 application of a second herbicide at least two
12 half-lives after the application of the first would be
13 a reasonable time.

14 MR. FREIDIN: Q. Sorry, just putting
15 some numbers to the hypothetical. If you had applied
16 2,4-D and 2,4-D had a half-life of let's say a month.

17 MR. CRAIG: A. Yes.

18 Q. If you waited two months and then you
19 went and applied glyphosate, you wouldn't expect a
20 synergistic effect?

21 A. That's true. That's probably my
22 understanding.

23 Q. Yes. Okay. Your Exhibit 748, page
24 18, second paragraph.

25 A. Yes.

1 Q. Mr. Castrilli asked you, or read to
2 you the sentence in the second paragraph -- the second
3 last sentence:

4 "Conversely, in ponds, lakes and
5 reservoirs residues of 2,4-D per se were
6 detected in water as much as six months
7 after treatment."

8 He suggested to you that that was
9 evidence that 2,4-D was persistent and that, in your
10 view, does that fact alone establish the point that
11 2,4-D is persistent?

12 A. No. I believe when we were
13 discussing this point we focused on the residue
14 component. Residue would mean that the compound would
15 be present at a concentration above the detection
16 capabilities of the instrumentation at least.

17 So the persistence -- to determine
18 whether a compound is persistent, I would look at the
19 half-life most definitely and one general definition
20 that we've used is the one proposed by the
21 International Joint Commission that a persistent would
22 be considered persistent if it had one characteristic,
23 being that it's half-life was 8 weeks, at least 8
24 weeks.

25 Q. Okay.

1 A. And...

2 Q. Sorry.

3 A. So that would be one factor, and I
4 would look at some other considerations, there's two,
5 for instance bioconcentration factors and
6 bioaccumulation.

7 Q. So the fact that something is
8 detectable, that a chemical is detectable in the
9 environment six months after it was applied doesn't
10 mean that it's persistent, that all by itself?

11 A. No, that alone does not qualify it as
12 persistent.

13 Q. Can you refer to page 39 of the
14 witness statement, please. Perhaps you could also have
15 Exhibit 1234, which is the report dealing with British
16 Columbia that Mr. Castrilli referred you to, and
17 perhaps you could open that at page 46.

18 Now, Mr. Castrilli referred you to the
19 first sentence on page 39 of your witness statement
20 under the heading 2,4-D which says:

21 "Significant direct toxic effects on fish
22 are exceedingly unlikely to occur as a
23 result of 2,4-D applications in timber
24 management."

25 He then referred you to page 46 of

1 Exhibit 1234 where there's reference to British
2 Columbia not using 2,4-D ester to any extent and that
3 the amine formulation of 2,4-D was used.

4 Are you aware, Mr. Craig, of the type of
5 competition in terms of species and amount that the
6 forest industry faces in British Columbia?

7 A. The species competition?

8 Q. The species, the type of species of
9 vegetation that are causing competition problems in
10 British Columbia?

11 A. Oh, no.

12 Q. Okay.

13 A. I have no idea of that.

14 Q. All right. Can you advise whether
15 differences in the species of competition that one is
16 concerned about and wants to control and the number of
17 different types of vegetative species that you're
18 trying to control on a particular site can affect the
19 efficacy of any particular herbicide?

20 A. That would sound reasonable to me,
21 that the different formulations of herbicide would be
22 more effective on different species.

23 Q. All right. I was going to --

24 A. I don't know which -- what the
25 relationships are, but it makes sense.

1 Q. All right. Let me just put a number
2 of propositions to you and you can tell me whether you
3 can agree with them.

4 This is my information, I want to see
5 whether you can confirm it, that the competition of
6 prime concern in British Columbia is red alder, if you
7 can answer yes or no.

8 A. I don't know that.

9 Q. That the number of species of
10 competition of concern in British Columbia is fewer
11 than in the area of the undertaking?

12 A. I wouldn't know that either.

13 Q. That the red alder that I referred to
14 is a tree species and not a shrub?

15 A. That sounds right.

16 Q. Okay, that's fine.

17 A. Not being a horticulturist I wouldn't
18 stake my reputation on it.

19 Q. That in British Columbia they deal
20 with the red alder situation by cutting into the tree
21 and applying herbicides manually?

22 A. Being a tree, that makes sense.

23 MR. CASSIDY: You're stuck with that one,
24 Mr. Freidin.

25 MR. FREIDIN: I'm not sure I understand

1 that. I'm not sure why it makes sense that it's
2 manually if it's a tree, but I'm not sure anything
3 turns on it.

4 MADAM CHAIR: I'm not sure you're going
5 to get a useful answer out of this question, Mr.
6 Freidin.

7 MR. FREIDIN: Well, no, I'm just
8 attempting to --

9 MADAM CHAIR: Are we getting around to
10 wildlife and aquatic resources.

11 MR. FREIDIN: We will be.

12 MR. CASSIDY: Before the break?

13 MADAM CHAIR: About five minutes, Mr.
14 Freidin.

15 MR. FREIDIN: Q. The evidence by MNR and
16 Industry in this hearing is that 2,4-D is applied
17 aerially in Ontario and that such method of application
18 is an essential tool.

19 Can you advise whether 2,4-D amine is
20 registered for aerial application for forestry in
21 Canada, and I'm asking this question because Mr.
22 Castrilli had lots of concern, it appeared, about
23 whether 2,4-D amine was used or 2,4-D ester was used.

24 Can you advise whether 2,4-D amine is
25 registered for aerial application for forestry in

1 Canada?

2 MR. CRAIG: A. I'm not entirely certain.

3 Q. All right. So I'm telling you it's
4 my information that it's not. You're unable to confirm
5 that at this time?

6 A. I can't comment on that, no.

7 Q. All right. Can you advise whether
8 2,4-D amine is effective when applied aurally?

9 A. Again, I have no specific knowledge
10 relating effectiveness to mode of application.

11 Q. All right. Now, you had a discussion
12 today about buffers.

13 A. Yes.

14 Q. And I understood you to say that
15 buffers are not necessary for protection of the aquatic
16 environment from insecticides.

17 A. Yes.

18 Q. All right. But you did say that
19 buffers were necessary to protect the aquatic
20 environment, and I take it from that you meant to
21 protect habitat such as described by Dr. Schiefer?

22 A. Yes, that's correct.

23 Q. All right. And again, could you
24 explain the reason why you don't believe that buffers
25 are required or are essential to protect the aquatic

1 environment from the effect of insecticides?

2 A. Primarily because of the -- this is
3 premised on the fact that the application rates would
4 only be the approved application rates, so they have to
5 be approved.

6 Q. Right.

7 A. Because as we discussed in other
8 evidence another time, if those approved rates are
9 exceeded there is an opportunity for damage. So the
10 application has to be limited to the approved
11 application rate, firstly. That then limits the
12 concentration that is delivered to the surface and, in
13 this case, I considered the surface of a receiving
14 water.

15 Based on the application rate, that then
16 allows me to calculate a concentration in the surface
17 layer of the receiving water, which I considered the
18 first 10 centimetres which essentially allows us a one
19 litre dilution and then I considered that for every
20 metre of depth there would be an additional 10-fold
21 dilution which is essentially another full 10 litres
22 down, and that if the surface water were moving, there
23 is the opportunity of dilution from upstream sources
24 and the rate of movement -- an increase in the rate of
25 water movement increases the rate of dilution of clean

1 water upstream.

2 So all of those factors go to lowering
3 the exposure concentration which, in the cases that
4 we've identified, reduce the exposure concentration
5 below effect concentration.

6 Q. It's my information, Mr. Craig, that
7 when these herbicides are registered for use in
8 forestry--

9 A. Yes.

10 Q. --in Canada, that the herbicide at
11 operational rates in fact is deposited directly into
12 water and they only okay or register the herbicide if
13 in fact it will not cause adverse effects on the
14 aquatic environment in those circumstances?

15 A. I'm not thoroughly familiar with the
16 registration procedure.

17 Q. But if that's the case it would seem
18 that what you have done, the analysis you've gone
19 through would basically support the same sort of
20 conclusion?

21 A. Yes, if that is the same exercise, if
22 the operational application rate is the same as was
23 applied in that test case then my conclusion would be,
24 based on other evidence, that there would be no effect
25 and that is consistent with what you've said.

1 Q. If you're not concerned about a
2 direct application at operational rates, I assume one
3 wouldn't be concerned about drift from a herbicide
4 applied somewhere else and some of it which drifted
5 over the water?

6 A. That's true.

7 Q. Okay. Can you get out Exhibit 712.

8 MADAM CHAIR: Let's have our break now,
9 Mr. Freidin.

10 The Board will be back in 20 minutes.

11 MADAM CHAIR: Are there any documents you
12 want the witnesses to look over?

13 MR. FREIDIN: No.

14 ---Recess taken at 10:20 a.m.

15 ---On resuming at 10:40 a.m.

16 MADAM CHAIR: Please be seated.

17 MR. FREIDIN: Q. If I can just go back
18 to Mr. Craig on that discussion about the buffers.

19 When you agreed with me that buffers are
20 required to protect fish habitat of the type described
21 by Dr. Schiefer, I take it that you were referring to
22 the buffers or reserves which are described in the Fish
23 Habitat Guidelines?

24 MR. CRAIG: A. That's correct.

25 Q. Right. The buffers that you talked

1 about not necessarily being essential to protect
2 aquatic environment from the effect of insecticides
3 were the MOE buffers which are dealt with and
4 prescribed in MOE documents other than -- well, in MOE
5 documents, those buffers are prescribed in the Fish
6 Habitat Guidelines.

7 A. Yes, that's right.

8 Q. Okay. I want to deal with a question
9 that Mr. Martel asked. He asked how quickly do
10 pesticides dilute. And I want to, if I might, with
11 reference to some documents, some evidence try to
12 address that question and the documents I would like
13 you to have in front of you are Exhibits 712 and
14 Exhibit 1233, 1233 is the Weeks Report.

15 A. I have 1233.

16 Q. Yes.

17 A. And 712?

18 Q. 712.

19 A. Oh yes, I have it.

20 Q. Okay. And if you could have the
21 Weeks Report open at page 8-33.

22 A. Yes.

23 Q. All right. So we have Weeks page
24 8-33 which has Table 8-24 on it, and you have exhibit
25 712, and if you could turn to page 259 of that

1 document, please.

2 A. Yes.

3 Q. Now, you gave evidence regarding
4 dilution occurring based on the depth of water and the
5 rate of water movement. I would like to refer you to
6 page 259 of Exhibit 712 and the second paragraph under
7 the heading Toxicity and Exposure to Forest Herbicides.

8 A. Yes.

9 Q. Do you agree with the comment that:
10 "Herbicides enter the aquatic environment
11 by direct application, spray drift,
12 mobilization in ephemeral stream
13 channels, overland flow and leaching."

14 A. Yes, that seems reasonable.

15 Q. This report looked at the results of
16 various entry mechanisms, and can we agree that, if we
17 turn to page 260, the direct entry mechanisms and the
18 drift entry mechanisms were during operational
19 applications?

20 You notice it says under heading Duration
21 of Entry, short (during application). My understanding
22 is that that was during an operational application?

23 A. Yes. I'm on page 260 and there is
24 that table.

25 Q. Yes.

1 A. Towards the top of the page, yes,
2 okay, I see entry mechanism on the left-hand column and
3 the duration of entry short (during application). Yes.
4 Yes, go ahead.

5 Q. And it's my information that during
6 application in this particular study is during
7 application in an operational situation?

8 A. Yes.

9 Q. Pardon me at operational rates, I'm
10 sorry, not necessarily an operational setting, but at
11 operational rates.

12 A. Yes. I haven't thoroughly reviewed
13 this to confirm that.

14 Q. Let's proceed on the assumption that
15 that is correct.

16 A. Yes, mm-hmm.

17 Q. Turn to page 261. Do you agree with
18 the statement that:

19 "Direct application is the mechanism most
20 likely to introduce significant
21 quantities of herbicide into surface
22 waters and has the potential to produce
23 the highest concentrations."

24 A. Yes, that appears reasonable and
25 logical to me, yes.

1 Q. All right. It then indicates in the
2 next paragraph that:

3 "In streams there is a rapid decline from
4 the initial peaks tend to occur...", and
5 they refer to Figure 16.2 which is on the preceding
6 page.

7 A. Yes, I see that.

8 Q. Could you explain the graphs on page
9 260 and what they say regarding how quickly pesticides,
10 in this case glyphosate, dilutes?

11 A. The graphs -- there are two graphs
12 and they are labeled A and B and they report the
13 concentration of glyphosate; in the case of A in an
14 experimentally oversprayed tributary, and in the case
15 of B, a main channel protected by a 10-metre unsprayed
16 buffer zone.

17 And the concentrations of glyphosate are
18 measured in the stream waters at various times
19 beginning from time zero to as long as 100 hours in the
20 case of A, and 70 hours in the case of B.

21 In the case of A the tributary, which is
22 oversprayed, the concentration of glyphosate peaks
23 within, I would presume from the scale of the graph,
24 within several hours at a high of 160 parts per
25 billion - and that would be micrograms per litre - and

1 within, certainly by within 10 hours it drops to one
2 quarter of that concentration down to about 40 parts
3 per billion.

4 And then there is another event indicated
5 of rain and the concentration increases, and I would
6 presume this would be from direct runoff of the
7 adjacent surface areas and it would peak to about 110,
8 and then within -- again within, let's say, a four-hour
9 period drops to 20, which is essentially 25 per cent --
10 pardon me, be a little more than 20 per cent, and then
11 gradually declines.

12 So that it would appear that within a
13 10-hour period, for instance, 80 per cent of the higher
14 concentrations would dissipate to the lower level and
15 they continue to decrease on an exponential decline
16 until the last rate of measurement was about 100 hours,
17 I would say about four days after.

18 Q. So about four days after the
19 introduction of glyphosate at an operational rate the
20 glyphosate concentration was non-detectable four days
21 later?

22 A. Yes. It appears that the last two
23 points are very close to that zero level and I'm not
24 entirely familiar with this paper. There may be a
25 table of data that confirmed that, but it approaches

1 zero on the scale.

2 Q. And in the other case with -- in the
3 case of B where you had the buffer, can we just agree
4 that you have the same sort of occurrences, although
5 the concentrations which occur in the stream are
6 significantly less either to begin with or after the
7 rain incident, but we have the same trend, that after a
8 period of time, in this case two to three days, it
9 appears that the glyphosate concentrations are near the
10 non-detectable level, if they are not non-detectable in
11 fact?

12 A. Yes, that's true. Also the
13 concentrations measured even at the peak levels are
14 almost 100 times lower than measured in direct
15 application situation.

16 For instance, the peak in the first blip
17 peaks at 1.5 parts per billion where the peak in direct
18 application is 160, and that is about a hundred-fold
19 difference.

20 So there are two orders of magnitude
21 lower concentrations resulting in the case of with a
22 buffer strip in place where there's no application.

23 Q. Okay. Now, would you just turn to
24 Weeks, keep that report there in front of you.

25 A. Yes.

1 Q. At page 8-33.

2 A. Yes.

3 Q. And Weeks reports in Table 8-24
4 the LC50 or the EC50 for these various representative
5 species in the first column?

6 A. Yes.

7 Q. And can you confirm for me that the
8 concentrations of glyphosate which are shown on page
9 260 of Exhibit 712 that we have just gone through,
10 which were applied at operational rates, are all below
11 not only the LC50 but one-fifth LC50?

12 A. The LC50s documented on page 8-33 of
13 Exhibit 1233 for the various species of fish are all
14 below 2 milligrams per litre. So for convenience sake
15 we can use the value 2.

16 Q. Yes.

17 A. And 2 milligrams per litre is
18 equivalent to 2,000 micrograms per litre.

19 The peak concentration of glyphosate
20 directly applied to the stream in Figure 16.2 A of
21 Exhibit 712 peaks at 160 micrograms per litre, which is
22 12 times below the LC50 value.

23 As a matter of fact you asked about the
24 one-fifth value and that would be 400 micrograms per
25 litre, and in fact the peak exposure concentration is

1 2 1/2 times below the one-fifth value.

2 Q. All right. So just --

3 A. Of that LC50.

4 Q. Just summarizing then, the effect of
5 an operational -- the introduction of glyphosate at an
6 operational rate directly into the stream is below the
7 one-fifth LC50 as reported by Weeks?

8 A. That's correct.

9 Q. In the amount that you've indicated?

10 A. That's correct.

11 Q. Thank you. Could you have in front
12 of you again -- keep Weeks in front of you.

13 A. Yes.

14 Q. And also have Exhibit 604C.

15 MR. CASSIDY: Is that the ESSA document?

16 MR. FREIDIN: That's the ESSA document,
17 yes.

18 MR. CASSIDY: On pesticide use?

19 MR. FREIDIN: Yes.

20 MR. CRAIG: Yes.

21 MR. FREIDIN: Q. I think the pages you
22 will need are 604C pages 20 and 22.

23 MR. CRAIG: A. Yes.

24 Q. And I'm going to be referring you to
25 page 7-3 of the Weeks report, that is where I want to

1 start.

2 A. Yes.

3 Q. Now, the reason I've asked you to
4 have those documents in front of you, Mr. Craig, is
5 that Mr. Castrilli asked a lot of questions during his
6 cross-examination about the maximum doses of herbicide
7 being applied and he spent a lot of time having you
8 indicate what the results were of the maximum doses
9 being applied, and I want to be absolutely clear what
10 those situations were, where the maximum doses were
11 applied.

12 And am I correct that what the maximum
13 dose is is defined on page 7-3 of the Weeks report,
14 second paragraph under the heading Wildlife Exposure
15 Estimates?

16 A. Yes, I have that.

17 Q. And am I correct that it describes
18 the maximum dose as being highly unlikely or extreme
19 dose estimates?

20 A. Yes, that's correct.

21 Q. So that whenever we read any of the
22 tables or we review the examination of you by Mr.
23 Castrilli where you were referring to maximum doses and
24 the results, we're looking at the results of situations
25 where the doses or the amount of herbicide which was

1 applied was a dose which was highly unlikely or
2 extreme?

3 A. Yes, that was my understanding.

4 Q. Then, if we look at the tables and we
5 want to determine what the effect might be in a more
6 realistic situation where herbicides are being applied
7 at operational or approved rates, we look at the
8 heading of the table which refers to it as the
9 realistic dose or the typical dose, I think both--

10 A. Yes.

11 Q. --terms are used, and is that not
12 exactly what it says in the second paragraph that I
13 have referred you to?

14 A. That's true, yes.

15 Q. Okay. Now, could you go up -- how am
16 I going to do this. Could you take those documents
17 with you, both those documents and go over to the flip
18 chart.

19 In the interest of saving some time I
20 have done some -- put some things on the flip chart
21 that I would like you to work with.

22 A. May I just interject briefly. Since
23 you identified, we are going to refer to Exhibit 1235.

24 Q. Not right now.

25 A. All right. When we come to that, if

1 I might interject.

2 Q. Sure.

3 A. Yes.

4 Q. But we won't miss 1235.

5 A. I'm sorry, take Weeks, yes.

6 Q. Take the 604C and take Weeks and you
7 will need --

8 MR. CRAIG: Okay.

9 MR. FREIDIN: Q. Take something that you
10 can mark -- have you got a red marker or something?

11 MR. CRAIG: A. Yeah.

12 Q. And will you flip over until you
13 get -- just flip over, I'll tell you when to stop.
14 That's the one, okay.

15 Now, what I have done there, maybe you
16 could move over to the right-hand side so the Board can
17 see. I want to be clear as to the label rates or the
18 approved rates for application of 2,4-D and glyphosate
19 in Ontario, what Weeks describes as being typical and
20 what Weeks describes as being the maximum.

21 A. Yes.

22 Q. See where it says Weeks maximum?

23 A. Yes, I do, yes.

24 Q. You describe that as highly -- or
25 extreme or highly unlikely. Could you just write down

1 under Weeks maximum highly unlikely in the little --
2 right there, yes.

3 A. Right in here?

4 Q. Yes.

5 MADAM CHAIR: Why are we calling that
6 highly unlikely?

7 MR. FREIDIN: Because Mr. Weeks -- or Dr.
8 Weeks said that's what they were in the second
9 paragraph on page 7-3 of his report.

10 Q. And under typical, could you put down
11 what Mr. Weeks -- or Dr. Weeks refers to that as as
12 being realistic. And we have agreed, Mr. Craig, that
13 realistic means that amount or dose which would be
14 applied in accordance with approved label rates?

15 MR. CRAIG: A. Yes.

16 Q. And Ontario label rates I think
17 speaks for itself. Now --

18 MADAM CHAIR: 1990?

19 MR. FREIDIN: 1990. Sure, put down
20 Ontario label rate, 1990.

21 MR. CASSIDY: What's the little 1 beside
22 it there? Is that the reference to --

23 MR. CRAIG: There's a little 1 here.

24 MR. FREIDIN: Oh, I'm sorry that was
25 supposed to be for a footnote.

1 MR. CRAIG: There is a footnote here. Is
2 that what it refers to?

3 MR. FREIDIN: Yeah.

4 MR. CRAIG: I didn't prepare this.

5 MR. FREIDIN: No, I know, I prepared it.

6 MR. CRAIG: All right.

7 MR. FREIDIN: But you're going to put in
8 all the important numbers, Mr. Craig.

9 MADAM CHAIR: You can put author Mr.
10 Freidin.

11 MR. FREIDIN: No, no, I'm not the author
12 of this document, it will be Mr. Craig.

13 MR. CASSIDY: You can put your signature
14 on it.

15 MR. FREIDIN: Q. Now, for the Ontario
16 label rates would you agree with me -- take a look at
17 604C at pages 20 and 22 and can you confirm for me that
18 it in fact describes what the Ontario label rates are
19 for those two herbicides?

20 Imagine how long it would have taken if I
21 hadn't done this.

22 MR. CRAIG: A. 20, 22. Okay, yes.
23 Let's -- yes. Okay, I have those.

24 Q. And the Ontario rate for 2,4-D as
25 found at page 22 and is it 1.7 to 5.1 kilograms per

1 hectare?

2 A. That's correct.

3 Q. Could you put that in the appropriate
4 box.

5 A. Okay.

6 Q. And for glyphosate, we find the
7 approved rate for forestry use in Ontario or in Canada
8 as 1.1 to 2.1 kilograms per hectare?

9 A. Yes, that's right.

10 Q. Put that in the appropriate box.

11 A. Okay.

12 Q. Now, for Weeks typical exposure --
13 dose, pardon me, the typical rate during -- or approved
14 rate, would you turn to page 7-6 of the Weeks report.

15 A. Yes.

16 Q. And for 2,4-D ester he has it as 4.48
17 kilograms per hectare?

18 A. Okay.

19 Q. Can you stick that in.

20 A. Yes.

21 Q. And he has for the maximum rate 7.85?

22 A. That's right, yes.

23 Q. And for glyphosate on the same table
24 he has for typical rate 1.68?

25 A. Yes.

1 Q. And for the highly unlikely he has
2 4.48?

3 A. Yes.

4 Q. Okay. I think that's fine.

5 MR. FREIDIN: Can we mark that as the
6 next exhibit, Madam Chair.

7 MR. CASSIDY: What are you going to call
8 it?

9 MR. FREIDIN: Comparison of approved and
10 highly unlikely doses of 2,4-D and glyphosate.

11 MADAM CHAIR: Exhibit 1264.

12 ---EXHIBIT NO. 1264: Hand-drawn document depicting
13 comparison of aproved and highly
14 unlikely doses of 2,4-D and
glyphosate.

15 MR. CRAIG: Comparison of approved
16 and...?

17 MR. FREIDIN: Highly unlikely doses of
18 2,4-D and glyphosate.

19 MR. CRAIG: Okay. Do we have an exhibit
20 number?

21 MADAM CHAIR: That will be Exhibit No.
22 1264.

23 MR. FREIDIN: Q. Now, Mr. Craig, it's my
24 information that those approved rates for the Ontario
25 situation apply to both ground and aerial application.

1 Are you able to confirm that?

2 MR. CRAIG: A. I can't confirm that
3 specifically.

4 Q. All right, that's fine. Well, let's
5 assume -- let's proceed on the assumption that they do.

6 A. All right.

7 Q. I think you can probably return to
8 your seat or you can sit down again.

9 A. Well, I think I'll go back to where
10 the rest of my material is.

11 Q. So can we agree by looking at that
12 exhibit that the Weeks typical or realistic dose is
13 within the range of the approved label rates for 2,4-D
14 and glyphosate?

15 A. Yes, that's quite correct.

16 Q. In Ontario?

17 A. Quite correct, yes.

18 Q. Right. And that what Weeks describes
19 as maximum or highly unlikely is beyond what is
20 approved for use in Ontario?

21 A. That's correct.

22 Q. And would it be fair then to say that
23 if we wanted to look at Weeks and try to determine what
24 the likely effect might be of doses within the label
25 rate, that we would be -- receive more accurate

1 information if we looked at Weeks results for typical
2 as opposed to maximum?

3 A. Yes, that's quite correct, more
4 representative.

5 Q. Thank you. Now, Mr. Castrilli also
6 referred you a number of times to tables which
7 indicated the results of -- well, he referred you to a
8 number of tables and he used the phrase direct
9 overspray from aerial application.

10 Now, it's my reading of the report that
11 there is no table that actually uses the word direct
12 overspray from aerial application?

13 A. Yeah. I would have to double check
14 on that, for the tables that we referred to.

15 Q. Right. Well, take a look at --

16 A. Yeah. Let's look at them.

17 Q. Can you go to Table 7-6, for example,
18 on page 7-13, there's reference to direct spraying.

19 A. Yes.

20 Q. And I guess what I'm trying to
21 clarify, Mr. Craig, is that if you were agreeing that
22 the table indicated the results of direct overspraying
23 that you were referring to the tables or the recording
24 of the results of direct spraying?

25 A. That's where my evidence has been

1 directed.

2 Q. Okay.

3 A. Yeah. And where we spent a lot of
4 time focusing on potential spill situations into ponds
5 and reservoirs.

6 Q. Right. And the column which is
7 entitled direct spraying--

8 A. Mm-hmm. Yes, I see that, on Table
9 7-6.

10 Q. Can we agree that where they refer to
11 the results of direct spraying and they're talking
12 about maximum, they're talking again of maximum doses
13 which is the highly unlikely dose?

14 A. That's correct, yes. That's my
15 understanding.

16 Q. And typical would have the same
17 meaning, direct spraying but of an amount which would
18 be an approved amount?

19 A. That's my understanding, yes.

20 Q. Okay. Could you go to page 8-27,
21 please.

22 A. Yes.

23 Q. You will find Table 8-18.

24 A. Yes, I have that.

25 MR. FREIDIN: If I could just have one

1 moment, Madam Chair.

2 Q. Now, Mr. Castrilli spent some time
3 with you on the top part of Table 8-18.

4 MR. CRAIG: A. Yes.

5 Q. And the risk levels being reported as
6 significant.

7 A. Yes.

8 Q. Do you see those? Can you confirm
9 for me that the risk levels which are being reported as
10 being significant are risk levels which are the result
11 of an application at the highly unlikely or maximum
12 dose, not typical?

13 I might be able to speed this up a little
14 bit.

15 A. Oh. Well, as a matter -- yes, I'm
16 referring to Table 7-6 and the risk level is in
17 reference to a concentration which would result in a
18 spill in a pond which is 1.7 parts per million which is
19 even higher than the maximum level identified at 1.,
20 let's say, 3.

21 Q. Thank you. Okay. I'll give you a
22 little break here for a second, Mr. Craig. Mr. Eedy,
23 can you go to page 29 of the witness statement.

24 MR. CASSIDY: It's Dr. Eddy.

25 MR. FREIDIN: Q. I'm sorry, Dr. Eedy.

1 Mr. Castrilli referred you to the section, Direct Toxic
2 Effects on Terrestrial Animals, and in particular the
3 second sentence:

4 "Surface exposure for wildlife is not
5 likely to represent the most important
6 route of exposure due to the natural
7 barrier provided by fur, feathers and
8 skin."

9 And there was a discussion about the
10 introduction of pesticides through licking and
11 grooming.

12 DR. EEDY: A. Yes.

13 Q. And if we look at the Weeks report at
14 page 7-6, do you have that?

15 A. Yes, I have that.

16 Q. Now, if you look at 7-6 and we look
17 at the first full paragraph under the table and you
18 look at the second last sentence it says:

19 "In both realistic and extreme exposure
20 mammals and birds are assumed to receive
21 an oral dose from grooming their fur or
22 preening their feathers."

23 A. That's correct.

24 Q. Now, I will be quite frank with you,
25 Dr. Eedy, I then went to the section over on page 7-9

1 for ingestion doses thinking that I would perhaps find
2 a reference to oral doses from grooming included under
3 the discussion of ingestion doses, and there is no such
4 reference.

5 Based on your reading of these kind of
6 reports, can one make any assumption as to whether
7 Weeks would have included the oral dose from grooming,
8 which was excluded from dermal on page 7-6, in
9 consideration of total ingestion doses, notwithstanding
10 he doesn't make a specific reference to it?

11 A. To be scientifically correct one
12 would do that. Whether he did or not, I mean, it could
13 have been a slip in the methodology as well.

14 Q. Okay. I guess only perhaps Mr. Weeks
15 would know for sure.

16 A. Only he would know, yes.

17 Q. Okay, thank you.

18 Q. Mr. Craig, just another bit of
19 terminology. When you describe or when Weeks describes
20 the highly unlikely dose, would you agree we could also
21 describe it as the prohibited dose in Ontario?

22 MR. CRAIG: A. That's my understanding,
23 it's above the approved levels, it would be an
24 unapproved level.

25 Q. Thank you. Now, Mr. Craig, Mr.

1 Castrilli referred you to page 31 of the witness
2 statement and I would like you to look at that, please.

3 A. Yes.

4 Q. Under the heading 2,4-D where you
5 state:

6 "Current scientific evidence indicates
7 that 2,4-D can be used in timber
8 management activities in accordance with
9 authorized procedures without risk of
10 significant adverse effects on wildlife."

11 And then you make the reference to Weeks
12 having estimated that only at extreme doses -- he's
13 estimated that only at extreme doses present an
14 unacceptable risk to wildlife. He then took you to
15 page 8-1 of Weeks.

16 A. Yes.

17 Q. To the quote under the heading
18 Wildlife Toxicity Surrogates.

19 A. Yes.

20 Q. Where it says:

21 "However, toxicity testing has been
22 conducted on relatively few wildlife
23 species and testing has been confined to
24 a few avian and mammalian species.
25 Laboratory studies have been done on

1 inbred strains of test animals,
2 particularly rats and mice to estimate
3 human toxicity."

4 He suggested that the passage that I just
5 read to you indicated that the conclusion that you came
6 to on page 31 of the witness statement was not
7 warranted because he suggested to you that toxicity
8 tests have been conducted on relatively few wildlife
9 species.

10 And my question for you is: In worse
11 case risk assessment, is it common to assume extremely
12 large doses?

13 A. In worse case risk assessment?

14 Q. Right, when you're trying to
15 determine the worse case. .

16 A. Yes.

17 Q. is it common to assume extremely
18 large doses?

19 A. It's not uncommon.

20 Q. Why is it not uncommon?

21 A. Primarily to determine the level of
22 safety that is available, in any kind of bioassay
23 assessment, Madam Chair, it's important not only to
24 know what the effects are likely to be at a prescribed
25 exposure rate but also to determine how high that

1 exposure level has to be before one sees an effect.

2 And in that process one might select
3 another exposure regime which could be a higher level
4 of exposure which would be at the further end of the
5 probability scale of that event happening, nonetheless
6 there may be some probability however small.

7 When one compares effects at an extreme
8 probability level with a more normal probability or
9 more reasonable probability, it provides some estimate
10 of the level of safety or the margin of safety that's
11 available in a normal use of that product at the most
12 frequent, most probable rate of use of that product.

13 So that's why a higher concentration or a
14 maximum concentration would be used.

15 Q. Okay, thank you. If I could just
16 have a moment. All right. Would you turn to the Weeks
17 report, please, page 8-5.

18 A. Yes.

19 Q. Now, Mr. Castrilli spent some time
20 with you on this table and he had you compare the
21 one-fifth LD50 to the extreme dose estimate.

22 A. Yes.

23 Q. And I think you agreed with him that
24 in some cases the extreme dose, or what is referred to
25 as the highly unlikely dose exceeded the one-fifth

1 LD50?

2 A. That's true.

3 Q. He didn't spend any time at all
4 looking at realistic or typical dose, and can you
5 advise: If we look at the realistic dose estimates
6 instead of the extreme dose estimates, what information
7 is indicated in relation to whether the dose is causing
8 one to exceed or not to exceed the one-fifth LD50?

9 A. In the case of birds, the realistic
10 dose estimate in all of the examples cited does not
11 exceed the one-fifth LD50; in the case of mammals, none
12 of the realistic dose estimates exceed the one-fifth
13 LD50; in the case of the amphibian example, the
14 realistic dose does not exceed the one-fifth LD50; and
15 in the case of reptiles, the realistic dose estimate
16 does not exceed the one-fifth LD50 estimate.

17 Q. I now want to ask you about Exhibit
18 1235A, and you said you wanted to say something about
19 that when we got to it. So you go first.

20 A. Thank you.

21 Madam Chair, when I prepared this exhibit
22 I wanted to draw to your attention that I made an
23 error, a calculation error and I would like to correct
24 that, if I may.

25 MADAM CHAIR: Yes, please do, Mr. Craig.

1 MR. FREIDIN: And that is the calculation
2 of the pond volume that I think was being undertaken to
3 determine whether the size of the pond was one where
4 one would likely find fish; wasn't that the --

5 MR. CRAIG: Yes. This was a scenario of
6 a 20-litre volume of I believe it was 2,4-D - I'm
7 trying to remember, I think it was, yeah - a 20-litre
8 volume of 2,4-D was spilled into a pond to generate a
9 concentration of 1.7 milligrams per litre and that then
10 led to some risk estimates as to whether or not the
11 risk was significant or not significant.

12 And in my calculation I identified that
13 for 20 litres to generate a 1 milligram per litre
14 concentration you would need essentially 20-million
15 litres. I then calculated that in order to generate a
16 higher concentration that a larger volume would be
17 required; of course, that's not correct. A larger
18 volume would result in a lower concentration because it
19 would be more diluted.

20 I should have -- what I did was I
21 multiplied, I should have divided. So if I can correct
22 that, then I'll follow through with this.

23 In order to generate a 1.7 milligram per
24 litre concentration a lesser volume would be required
25 and that volume would be not 34-million litres but it

1 would be 11,800,000 litres.

2 This relationship is still the same. One
3 cubic metre is equal to a thousand litres. This means
4 that the pond volume would be not 34,000 cubic metres
5 but it would be -- it would be reduced by one
6 thousandth, so that then is 11,800 cubic metres.

7 If the pond volume depth were 2 metres,
8 then the surface area would be essentially 11,800
9 divided by 2 which becomes 5,900 -- pardon me, yes,
10 5,900 metres squared which divided by 10,000 would not
11 be a 1.7 hectare surface area but it would be a 0.6.

12 And following through with a similar
13 correction for the 5, this would be 23, 60, which would
14 result in approximately 0.2 hectare surface area.

15 So my error in choosing to multiply
16 instead of dividing results in fact a larger estimate
17 of surface area. They in fact should be lower --
18 smaller surface areas.

19 So these would be ponds of, let's say in
20 the case of 2-metre depth, the pond would be about one
21 third, should actually have been one third of my
22 original estimate.

23 MR. FREIDIN: Q. And what is the
24 significance of having a smaller number, keeping in
25 mind the purpose for which you did the calculation in

1 the first place?

2 MR. CRAIG: A. Well, the reason for this
3 exercise was to identify what type of pond we would be
4 dealing with with respect to biological communities and
5 fisheries and effects in that regard, and I think Dr.
6 Schiefer at that stage then identified what sorts of
7 species might be present and what communities in an
8 overall ecosystem perspective would be affected given
9 this kind of a spacial scenario.

10 MADAM CHAIR: If we look at the numbers
11 being made that much smaller, and what I recall from
12 what Dr. Schiefer had said, that there would be even
13 less likelihood of fish species being present in
14 waterbodies of that size.

15 DR. SCHIEFER: That's true, Madam Chair.
16 In the area of the undertaking the likelihood of having
17 natural fish populations of the species in that list in
18 a pond of .6 -- .2 hectares there is almost no
19 probability.

20 Those ponds of that size would not
21 provide the habitat requirements for any of those
22 species. So it's an artificially small pond to
23 represent reasonable natural conditions in the area of
24 the undertaking.

25 MR. FREIDIN: Q. And I believe we got

1 into this whole discussion about the pond volume
2 because we were looking, or Mr. Castrilli was directing
3 you to Table 8-18 on page 8-27 and reviewing the
4 results or the risk levels of the maximum dose.

5 MR. CRAIG: A. That's correct.

6 Q. Okay.

7 A. If I could also add, with the
8 calculations of the reservoir volume, I double checked
9 those and I feel those remain correct. So I had that
10 half right.

11 MADAM CHAIR: Thank you, Mr. Craig. It
12 just goes to show you can't pull anything over our eyes
13 at this hearing.

14 MR. CRAIG: That's right.

15 MADAM CHAIR: We catch on those things
16 very quickly.

17 MR. FREIDIN: Q. Dr. Schiefer, Mr.
18 Castrilli was asking some questions about, you know,
19 whether there would be an effect on surface feeders as
20 a result of herbicides being applied over water.

21 DR. SCHIEFER: A. That's correct.

22 Q. Does the environmental stress
23 irritant, which I think was -- I'm not sure whether you
24 used the word or whether Mr. Castrilli did - does the
25 environmental stress irritant at the surface which

1 leads to fish going to deeper depths -- well, does
2 it -- pardon me, caused them to go to deeper depths and
3 affects surface feeding. I want to know for how long
4 does that occur?

5 A. Well, most species that do surface
6 feed do not spend lengthy times at the surface feeding.
7 If they did they would be too susceptible to predators
8 such as osprey, mink, otter, so typically those species
9 will spend the majority of their time under cover or at
10 greater depths and will surface, feed normally early in
11 the morning or late in the evening, so they don't spend
12 a lot of time at the surface.

13 Q. But if their surface feeding is
14 affected by the presence of herbicides in the water,
15 they go to deeper depths, I take it from your evidence
16 that over a fairly short period of time that herbicide
17 breaks down or dilutes such that it will no longer
18 prevent the fish from coming up to the surface.

19 Is that a fair assumption?

20 A. Well, Mr. Craig is probably a better
21 person to make the statement that -- certainly looking
22 at the one-fifth LC50s there would not be a
23 behavioural barrier to that activity based on the
24 concentrations you're looking at. I think that's
25 clearly evident.

1 Q. Anything you could add, Mr. Craig? I
2 mean...

3 MR. CRAIG: A. My observations of
4 dilution, because of my experience with effluent
5 dispersion exercises and whatnot, is that in a scenario
6 where, for instance, a five gallon can tipped into a
7 small pond, mixing is not instantaneous, it billows out
8 into that local area, and even a large reservoir for
9 instance, there is a mixing component and dispersion
10 and after dilution there would be degradation.

11 So once that effect concentration
12 threshold is reached and degradation and dilution and
13 dispersion continue, of course, there would be less and
14 less of a biological barrier or a toxicological barrier
15 to those activities.

16 Q. Okay. In Panel 9B Dr. Rachman
17 testified regarding the final -- well, first of all,
18 why don't we turn to Exhibit 1236.

19 MR. CASSIDY: That's the Record of
20 Decision?

21 MR. FREIDIN: That is the final
22 Environmental Impact Statement -- I'm sorry, you're
23 right.

24 MR. CASSIDY: It's the Record of
25 Decision?

1 MR. FREIDIN: It's the Record of
2 Decision, sorry.

3 MR. CRAIG: I have it.

4 MR. FREIDIN: Q. And also you should
5 have 1237. In fact, I think for the purposes of my
6 question we're only going to need 1237. Turn to page
7 (xii).

8 MR. CRAIG: A. Where in 1237?

9 Q. 1237, (xii), right at the beginning.
10 And seeing you have the only copy I will ask you the
11 question, Mr. Craig, I think.

12 A. Page 12. (xii), yes.

13 Q. Yes. Now, in Panel 9B Dr. Rachman
14 testified regarding the final decision regarding 2,4-D
15 in human health and she referred to the heading Human
16 Health and Safety.

17 A. Yes.

18 Q. Does the summary make any general
19 conclusions regarding the use of 2,4-D and its
20 potential effect on wildlife?

21 A. The reference in that section is
22 entirely to human health and I believe occupational
23 exposure.

24 Q. And the next section, is there a
25 conclusion?

1 A. In the wildlife section?

2 Q. Yes.

3 A. Yes, there are two paragraphs, and the
4 conclusion under Wildlife, the first statement is that:

5 "All 11 herbicides and 4 additives
6 provide ample margins of safety for
7 terrestrial aquatic life when applied
8 using typical rates and method."

9 Q. All right. And we have already
10 agreed that typical rates mean approved rates?

11 A. Those are comparable to those
12 approved by Ontario.

13 Q. Right. And it's my understanding
14 that the 11 herbicides included 2,4-D?

15 A. Yes, that's correct.

16 Q. Dr. Schiefer, you gave some evidence
17 about glyphosate becoming bound up in bottom sediments
18 during your evidence, and if one wants to minimize the
19 uptake of glyphosate by fish which might be introduced
20 into the environment through a forestry use, is the
21 fact that the glyphosate becomes bound up in the
22 sediment a good thing or a bad thing?

23 DR. SCHIEFER: A. I believe Mr. Craig
24 gave that evidence.

25 Q. I'm sorry. All right. Do I have to

1 repeat the question, Mr. Craig?

2 MR. CRAIG: A. No. I guess briefly it
3 is beneficial and the reasons why it's beneficial is
4 that it tends to isolate the chemical into one
5 compartment of the aquatic environment, firstly;
6 secondly, it places the glyphosate in closer proximity
7 to bacterial organisms which would be critical to the
8 degradation of that compound, and in the longer term
9 where there is active sedimentation in a river
10 tributary system, there's an opportunity for overlain
11 of clean sediment in cases where there would be a
12 residual of glyphosate, and that would further isolate
13 that area. But, in general, it would promote the
14 degradation process.

15 Q. And also be unavailable to fish while
16 it's bound up in the sediment?

17 A. I'm sorry?

18 Q. It would also be unavailable for
19 uptake by fish if it was bound to the sediment?

20 A. Yes, it would be -- that is, a large
21 proportion of it would be in the sediment phase than
22 the water phase, therefore, it would reduce the
23 exposure concentration in the water.

24 Q. Okay, thank you.

25 DR. SCHIEFER: A. Mr. Freidin, if I

1 could just perhaps add to that. Normally the only time
2 you have a problem in the aquatic ecosystem with
3 materials being bound up in sediments is where they
4 bioaccumulate and they are food chain pathways to
5 higher organisms. That's not the case with a compound
6 like glyphosate, so that problem would not occur.

7 Q. It reminds me of my days of
8 methylmercury.

9 Now, Mr. Castrilli spent some time, Mr.
10 Craig, talking about Rodeo.

11 MR. CRAIG: A. Yes.

12 Q. And could you turn to the Weeks
13 report at page 8-32:

14 A. Yes.

15 Q. And we have Rodeo described or
16 results described on page 8-32, and on the opposite
17 page 8-33 Roundup formulation results are reported.

18 A. Yes.

19 Q. Now, Mr. Castrilli spent a lot of
20 time comparing the results of the risk levels from
21 Roundup as opposed to Rodeo and was stressing with you
22 that there were significant results for the Roundup
23 formulation when there were unrealistic doses, the
24 maximum dose, but no risk for Rodeo and suggesting that
25 perhaps Rodeo should be used because it causes less

1 risk to fish.

2 It's my information, Dr. -- I mean Mr.
3 Craig, that Rodeo is not registered for use in forestry
4 in Canada and, therefore, regardless of what the
5 results may be it's not an option which is open in
6 Canada. Can you confirm my information is correct?

7 A. I can't, no. I would like to add
8 that when I -- the last several days when I've had a
9 chance to review more of this information, that
10 regardless of the active effect of the surfactant
11 involved in Rodeo -- or in Roundup and double checking
12 the information that we put forward in our witness
13 statement, there are studies conducted with Roundup
14 which would, of course, include the surfactant and we
15 were still identifying that there was little response
16 and, therefore, I still feel that the information we
17 put forward in our witness statement is reliable in
18 that regard from my perspective because we have
19 conducted reviews of information on the actual compound
20 which includes the glyphosate and the surfactant.

21 Q. And according to - this is an
22 additional matter - in Exhibit 1237, which is the final
23 EIS at page 2-29 Weeks makes the comment --

24 A. Sorry, what page was that?

25 Q. 2-29.

1 A. Yes. Yes, I have it.

2 Q. And this would be the situation in
3 the United States or the jurisdiction that he was
4 talking about, he says in the middle paragraph under
5 the heading Glyphosate --

6 A. I have the title at the top of the
7 page.

8 Q. Glyphosate?

9 A. Yes.

10 Q. Go down, about halfway down right in
11 the middle, just first word in from the left margin, it
12 says, "Rodeo is labeled."

13 A. Yes, I see that.

14 MADAM CHAIR: You lost us, Mr. Freidin.
15 Are you back in --

16 MR. FREIDIN: Back in 1237, final EIS
17 page 2-29.

18 MADAM CHAIR: Okay.

19 MR. FREIDIN: Q. And in relation to
20 glyphosate it states in the middle of the paragraph:

21 "Rodeo is labeled primarily as an aquatic
22 herbicide but is also labeled for
23 forestry."

24 Do you see that?

25 MR. CRAIG: A. I do.

1 Q. "The same cannot be said for
2 glyphosate."

3 It's my information that glyphosate is
4 not labeled as an aquatic herbicide but is used in
5 forestry for site preparation and release?

6 A. Yes, I see that too.

7 Q. There was a discussion about NNG
8 being carcinogenic.

9 A. Yes.

10 Q. I want to just just -- Exhibit 7 --
11 just hold on a second, Exhibit 734. Sorry, I'm having
12 trouble finding -- why don't we skip this. I'm going
13 to go past the lunch hour, so I'll come back to this.

14 Okay. Can you turn to Table 8-17 which
15 is found on page 8-26 of Weeks.

16 MADAM CHAIR: That was page...?

17 MR. FREIDIN: Page 8-26.

18 MADAM CHAIR: Thank you.

19 MR. CRAIG: Yes.

20 MR. FREIDIN: Q. And again, this page
21 8-26 and 8-27 were two pages that Mr. Castrilli spent
22 some time on where he was, in this case, comparing the
23 difference in terms of results; where in the one case
24 2,4-D amine was used and the other case it was 2,4-D
25 ester.

1 MR. CRAIG: A. Yes.

2 Q. Okay. And Mr. Martel -- we looked at
3 it and we found that there was a difference in the risk
4 levels reported; significant for 2,4-D ester when
5 introduced at the highly unlikely dose, no risk when
6 introduced at the highly unlikely dose for 2,4-D amine.

7 How big were the ponds which were used --
8 well, first of all, Mr. Martel asked what accounted for
9 the differences in the two ponds when they were the
10 same size. And can you advise how big the ponds were
11 in those two analyses?

12 A. The pond -- one body of water is
13 referred to as a pond and the other body is a
14 reservoir. Is that the distinction you wish to
15 differentiate?

16 Q. Well, perhaps you can advise me:
17 Were the bodies of water in which the tests were done
18 the same size or were they different sizes?

19 A. Well, they would be a little confused
20 in that for the pond scenario the concentrations are
21 the same for both the amine and the ester, and the
22 environmental effect concentrations are both cited as
23 1.7, and the volume that's spilled into the pond is
24 both -- is 19 litres for both ponds, so the pond
25 volumes would be the same.

1 Q. I'm only concerned about the top part
2 of both tables, just the ponds. So the ponds are the
3 same size?

4 A. That's correct.

5 Q. Okay. And Mr. Martel said: Well,
6 what accounted for the difference in the two in terms
7 of risk levels when the ponds were the same size?

8 So I'm just saying were you able to
9 indicate to me what the size of those ponds were?

10 A. Yes, from the exercise we just
11 completed.

12 MADAM CHAIR: That was the reason for
13 Exhibit 1235.

14 MR. CRAIG: That's right. Yeah, at a 2
15 metre depth the surface area would be in the order of
16 .6 hectares.

17 MR. FREIDIN: Q. All right. Well, I
18 will lead you on this one, it doesn't take as long. If
19 the pond size increased, take the case on the 2,4-D
20 ester.

21 MR. CRAIG: A. Yes.

22 Q. If the pond size increased to a size
23 more reflective of sizes of waterbodies with fish in
24 them in the area of the undertaking, would you expect
25 the differences which are shown in these two tables,

1 significant for 2,4-D ester and no risk for 2,4-D amine
2 to prevail?

3 A. Yes.

4 Q. Yes, you would or --

5 A. Yes. As I ---

6 Q. Well, you say yes a lot.

7 A. I would expect --

8 Q. All right.

9 A. Do you want me to continue?

10 MR. CASSIDY: One at a time.

11 MR. FREIDIN: Yes.

12 Q. I just noted, listening to you, you
13 often begin your answer, you just say yes, like saying,
14 yes, Mr. Freidin, I'll answer your question, and when
15 we read it in the transcript it may sound like you're
16 agreeing with my question or the proposition, that's
17 all.

18 MR. CRAIG: A. Let me explain.

19 Q. Okay.

20 A. In the case of the pond, Madam Chair,
21 dealing with the ester, as the volume of the pond
22 increased and as the surface area increased, then the
23 effect concentration would decrease; that is, more area
24 would produce more dilution and a lower effect
25 concentration, and at some stage of incremental size

1 then the relationship between the effect
2 concentration -- or that is, pardon me, the
3 environmental concentration would approach the LC50
4 values given on the left-hand column, and as the pond
5 became even larger, of course, then the environmental
6 exposure concentrations would become less than those
7 LC50s and indeed ad infinitum until they would not only
8 be lower than the one-fifth LD50 but lower than any
9 sublethal threshold concentrations. So, that is the
10 situation where the volume would increase.

11 DR. SCHIEFER: A. Mr. Freidin, perhaps I
12 could add. In our analysis of this, this could well be
13 an exercise in determining at what concentration the
14 effect is significant, or it could be an exercise of
15 determining how small a pond one would need for the
16 effect to be significant.

17 So that the selection of the size of the
18 pond is not arbitrary, in fact you decrease the size of
19 the pond until you reach a pond small enough to have a
20 significant effect, and it appears that that's, given
21 the very small dimensions of the ponds, that that would
22 be more the nature of this exercise.

23 Q. Thank you. Okay. Mr. Craig, looking
24 at Table 8-18 where they did the risk analysis for
25 2,4-D ester accidents, it's my understanding by reading

1 page 6-19 of the Weeks report that the formulation of
2 2,4-D which was used in the Weeks study was
3 butoxyethanol ester. You'll see that under effect, go
4 four up from the bottom, the middle column.

5 A. Yes. Yes, I see.

6 Q. The only formulation which is
7 registered -- the only formulation of 2,4-D which is
8 registered for use -- the only formulation of 2,4-D
9 registered for aerial application in Canada is the iso
10 octyl ester. Do you know whether -- can you confirm
11 for me that iso octyl ester is less toxic to fish than
12 butoxyethanol ester which was used in Weeks?

13 A. I can't confirm that right offhand,
14 I'd have to refer to some material.

15 MR. CASSIDY: Can you do it over lunch?

16 MR. CRAIG: Yes.

17 MR. FREIDIN: All right. Would you do
18 that over lunch?

19 MR. CRAIG: Sure.

20 MR. FREIDIN: MADAM CHAIR: Thank you.
21 It might be a good time to break, Madam Chair. I think
22 I will be about another hour, at most.

23 MADAM CHAIR: All right, Mr. Freidin.
24 You have been proceeding very quickly this morning and
25 the Board thanks you for that; however, the Board is

1 left with two impressions of your cross-examination,
2 and I'm just going to put that out for you to think
3 over at lunch.

4 MR. FREIDIN: Cogitate it.

5 MADAM CHAIR: The first impression is
6 that you're attempting in your cross-examination to
7 discredit Mr. Castrilli's cross-examination. I don't
8 think you have asked one question where it hasn't been
9 in response to the way that Mr. Castrilli raised an
10 issue; and the second impression that the Board is left
11 with is that you're attempting to pre-empt Mr.
12 Cassidy's re-examination.

13 If that is what you're intending to do
14 the Board will have something to say about that; if
15 that's not what you're intending to do because, as you
16 said before you're in a rather awkward position with
17 respect to the witnesses of the OFIA, then the Board
18 would like to know that as well.

19 MR. FREIDIN: Just for my, just so
20 understand you, when you say you believe that it
21 appears that I am attempting to discredit Mr.
22 Castrilli's cross-examination, what do you mean by
23 that?

24 MADAM CHAIR: Yes. What I mean is, that
25 you have chosen to focus entirely on issues that Mr.

1 Castrilli raised and in a way that suggests those
2 issues were erroneously raised in the material or that
3 information was not ascertained in a very clear way.

4 MR. FREIDIN: All right. Well, I can
5 tell you that what I'm trying to do is, where I believe
6 that information was elicited from witnesses - and this
7 is what I do through everyone's cross-examination, not
8 just this panel and just not Mr. Castrilli - but it is
9 my responsibility as counsel to my client but also for
10 the assistance of the Board, where it is my perception
11 that evidence elicited from a witness if left all by
12 itself only tells part of the story, and that it is my
13 view that the other part of the story should also be
14 before the Board, then it is my responsibility to make
15 sure that that other part of the story gets there so
16 that whatever decision the Board comes to is based on
17 my perception of what all of the evidence of a
18 particular report in this case demonstrates.

19 MADAM CHAIR: Aren't you running the risk
20 with reply evidence, Mr. Freidin, that we can go over
21 all your cross-examinations and say that we're
22 satisfied that you shored up that evidence during the
23 course of cross-examination and that we don't require
24 that to be brought out again in reply?

25 MR. FREIDIN: In some respects that is

1 true, you will see that in many --

2 MR. CASSIDY: And I would hope that's the
3 case, that will shorten the proceeding. I hope you're
4 absolutely right, Madam Chair.

5 MR. FREIDIN: That is fine. See, if I
6 can get the information that is required from an expert
7 witness that's sitting here right across the table who
8 just finished testifyng, you know, a day or two
9 earlier, then that is what I am seeking to do.

10 You note that in some cases I asked
11 questions at the beginning of Mr. Craig and you said:
12 well, when are we going to get on to fish and wildlife.
13 Those are situations where, because I can't get the
14 answer from this witness about what is the competition
15 in B.C., I have the responsibility to the Board to call
16 evidence now to support the suggestions that I was
17 making.

18 I believe it's important to try and get
19 the information from these witnesses, if possible, and
20 if I can't, then I'll call the evidence, so...

21 MADAM CHAIR: I guess from the Board's
22 point of view we're not convinced that you won't also
23 be bringing into reply evidence information that you
24 have obtained from the witnesses in this sort of
25 cross-examination and feeling that it's not adequate

1 when you reassess it six months from now and you'll be
2 bringing more in.

3 You can understand why we aren't
4 confident that won't happen, and the experience of this
5 proceeding is that we go over everything many times.

6 Anyway, we'll leave that with you over
7 lunch.

8 MR. FREIDIN: Sure, thank you.

9 MADAM CHAIR: We will be back in an hour
10 and a half.

11 ---Luncheon recess taken at 12:05 p.m.

12 ---On resuming at 1:40 p.m.

13 MADAM CHAIR: Please be seated.

14 Mr. Freidin?

15 MR. FREIDIN: Q. I think when we left
16 off, Mr. Craig, you were going to see whether you could
17 determine if there was any information as to whether
18 iso octyl ester was more or less toxic to fish than the
19 butoxyethanol ester.

20 MR. CRAIG: A. I've reviewed Exhibit No.
21 748. On page 20 there is a list of different salts of
22 2,4-D and the toxicities of those salts to the LC50s of
23 those salts to various fish, and for the comparison
24 I've identified that for Rainbow trout the
25 butoxyethanol salt has an LC50 of .65 versus the iso

1 octyl which has an LC50 of 96 milligrams per litre and
2 that represents a difference of about 150 times, so the
3 butoxyethanol formulation is about 150 times more toxic
4 than the iso octyl.

5 For blue gill sunfish, the LC50 for
6 butoxyethanol is about 1 milligram per litre; whereas,
7 the iso octyl formulation is about 20 milligrams per
8 litre. That represents a factor of 20 times, so the
9 butoxyethanol is 20 times more toxic than the iso octyl
10 formulation for sunfish.

11 So that clearly indicates that for these
12 two species, and I would anticipate for others as well,
13 that the butoxyethanol formulation would be more toxic.

14 MADAM CHAIR: Excuse me, Mr. Craig.
15 Which was the first species that you --

16 MR. CRAIG: Rainbow trout.

17 MADAM CHAIR: Thank you.

18 MR. MARTEL: The second.

19 MR. CRAIG: Blue gill sunfish.

20 MR. FREIDIN: Q. It was a more toxic
21 form of butoxyethanol that was used by Weeks?

22 A. That's correct.

23 Q. Dr. Eedy, could you turn to page 3 of
24 the witness statement. Do you have that, Dr. Eedy?

25 DR. EEDY: A. Yes.

1 Q. In the large paragraph in the middle
2 there, going almost down to the bottom five or six
3 lines up, starting on the right, "Dr. Euler...."

4 A. Yes.

5 Q. There's a reference to Exhibit 499,
6 "...has emphasized that habitat loss is
7 seldom a constraint on moose productivity
8 in Ontario."

9 And then you state:

10 "He noted that the recommended 130-
11 hectare clearcut area was based largely
12 on the protection of critical moose
13 wintering habitat."

14 Can I take it from that comment, Dr.
15 Eedy, that it's your position that the 130-hectare
16 clearcut area is not based exclusively on the
17 protection of critical moose wintering habitat?

18 A. I don't believe it is.

19 Q. And that being the case, would you
20 agree with me that even in a situation where one is not
21 concerned with winter habitat for moose, there may be
22 other reasons for the moose habitat guidelines being
23 applied in a rigorous fashion, and by rigorous fashion
24 I mean staying fairly close to the 80 to 130-hectare
25 clearcut size referred to therein?

1 A. I'd agree that this possibility
2 exists. It's something that would need to be assessed
3 on a site-specific basis.

4 Q. Thank you. Mr. Lindgren was asking
5 you some questions about index counts as opposed to
6 going out and counting actual species, and I wanted to
7 ask you whether you believed that the use of index
8 counts is an appropriate or inappropriate tool to use
9 in wildlife management?

10 A. I believe it's an appropriate tool.

11 Q. And why do you believe -- for what
12 purposes are they used and why do you believe it's
13 appropriate?

14 A. I believe that, I guess depending on
15 the resources available, that basically getting an
16 indication of -- provided one is doing them with a
17 statistically valid methodology that, you know, these
18 various different methods are appropriate.

19 MR. FREIDIN: Madam Chair, I would like
20 to file as two separate exhibits the following two
21 answers to MNR interrogatories for Panel No. 9A. The
22 first one is Interrogatory No. 9 and the second one I
23 would like to file is MNR Interrogatory No. 12.

24 (handed)

25 MADAM CHAIR: That will be Exhibit 1265.

1 ---EXHIBIT NO. 1265: MNR Interrogatory Nos. 9 and 12
2 re OFIA/OLMA Panel 9A and answers
 thereto.

3 MR. CASSIDY: Those are going to be filed
4 as a package, Mr. Freidin?

5 MR. FREIDIN: Sure.

6 Q. And, Dr. Schiefer, were you the
7 author of the answers to those two answers?

8 DR. SCHIEFER: A. Yes, I was.

9 Q. All right.

10 MR. FREIDIN: Madam Chair, I am not going
11 to take the time to go through these, I think the
12 answers speak for themselves.

13 Q. But would it be a fair summary, Dr.
14 Schiefer, to indicate in these two you have agreed with
15 certain portions of the evidence of Ministry of Natural
16 Resources regarding water acidification and the effect
17 of the Fish Habitat Guidelines and the Code of Practice
18 on stream temperatures?

19 DR. SCHIEFER: A. Yes. Interrogatory 9
20 relates to the effects on pH and No. 12 related to
21 maintenance of effects on water temperatures.

22 Q. All right.

23 A. That's correct.

24 Q. All right, thank you.

25 Dr. Eedy, during the cross-examination of

1 you by Mr. Hanna there was some discussion as to
2 whether the Moose Habitat Guidelines provided any
3 direction regarding the quantification of the size of a
4 reserve that there should be around aquatic habitat.

5 Could you please turn to Exhibit 310
6 which is the Timber Management Guidelines for the
7 Provision of Moose Habitat and confirm for me whether
8 or not there is guidance in relation to the size of
9 reserves in such situations.

10 And to speed this up, could you turn to
11 II -- Section II, sub (e), this is in the green part.
12 If you've got the coloured portion.

13 DR. EEDY: A. No, mine isn't coloured.

14 Q. See the heading Specific Area of
15 Concern Guidelines top left-hand concern?

16 A. These are the Timber Management
17 Guidelines or the original --

18 Q. The Timber Management Guidelines for
19 the Provision of Moose Habitat.

20 MR. CASSIDY: The Moose Guidelines.

21 (handed)

22 DR. EEDY: Sorry, I've got two copies and
23 actually I put the wrong copy in this book.

24 MR. FREIDIN: Q. Oh, all right.

25 DR. EEDY: A. It's one that somebody

1 copied only the right-hand pages, automatic zeros.

2 Q. All right. Do you have the page then
3 which has got the small Roman numerals (ii)?

4 A. Yes, I do, sorry.

5 Q. Under heading Specific Areas of
6 Concern Guidelines can you confirm whether there is
7 guidance in relation to this subject matter in Section
8 II sub (e)?

9 A. Yes. It says:

10 "A reserve is generally recommended
11 around aquatic feeding areas, mineral
12 licks and calving sites."

13 Q. And the size is referred to?

14 A. That's correct, a 120-metre reserve.

15 Q. Thank you. Mr. Craig, you made a
16 comment this morning that there is a risk to songbirds
17 if fenitrothion exceeds the approved rates.

18 In Exhibit 604C which is the ESSA report
19 in relation to pesticide use?

20 MR. CRAIG: A. Yes, I have that.

21 Q. Can you turn to page 34. I take it
22 by, first of all, approved rate would be anywhere up to
23 the maximum approved?

24 A. That's right.

25 Q. On page 34 near the bottom is the

1 heading Fenitrothion, it says that:

2 "The maximum registered rate application
3 is 280 grams per hectare."

4 And it also indicates that:

5 "Ontario's normal rate of application is
6 half of that, 140 grams per hectare."

7 Do you have any reason to doubt the
8 correctness of that statement regarding the rate which
9 is normally used?

10 A. No, I have not.

11 Q. Dr. Schiefer, you made the comment
12 yesterday that jurisdictions other than Ontario have
13 and use Fish Habitat Guidelines or fish guidelines,
14 that although they're not identical, they are similar
15 to the ones in Ontario in many respects.

16 Could you advise of the jurisdictions to
17 which you were referring and also could you indicate in
18 what ways those other guidelines are similar to those
19 used in Ontario?

20 DR. SCHIEFER: A. I can't give you a
21 detailed comparison because I don't have them handy for
22 reference. Generally the nature of those guidelines is
23 a prescription for buffer zones and the criteria for
24 buffer zones do tend to vary somewhat, however, their
25 objective is clearly to provide protection to aquatic

1 habitats and particularly sensitive habitat features.

2 We're working with guidelines -- similar
3 types of guidelines currently in Manitoba, we have
4 recently in Quebec, Nova Scotia, Newfoundland, and
5 several states in the United States.

6 Q. Thank you. Mr. Craig, during the
7 evidence -- or the cross-examination by Ms. Kleer we
8 got into that discussion about a cup of berries and you
9 made a calculation, 70 milligrams per day with
10 approximately the -- 70 grams, I'm sorry, of berries
11 per day was the allowable daily intake.

12 MR. CRAIG: A. Of 2,4-D.

13 Q. 2,4-D, yes. You also made the
14 comment that there was a hundred-fold safety factor.

15 A. Yes.

16 Q. And could you just explain what a
17 hundred-fold safety factor is and what you were
18 referring to?

19 A. Yes. In the derivation of the
20 calculation of the daily acceptable intake of 2,4-D,
21 there is the incorporation of a hundred-fold safety
22 factor which is applied to the NOEL, which is the
23 no-observed-effect level of 2,4-D on the rat system,
24 and I'm trying to recall from memory whether we are
25 dealing with, I believe it was a one or a two-year rat

1 study, and from that rat study no-observed-effect level
2 was determined, and it was that 2,4-D level for rats
3 that was used to develop the daily intake level and
4 that incorporated a hundred-fold safety factor.

5 So you take the NOEL, reduce it by 100
6 times and essentially divide it by a hundred and that
7 then became the estimated daily -- approved daily
8 intake value.

9 Q. All right. So just using some
10 numbers, if you were testing some product and you found
11 that at 1001 -- let's say it was 1001 berries you had
12 some effect, at a thousand you didn't, there would be
13 no effect if you ate a thousand berries, and you wanted
14 to apply a hundred-fold safety factor, how many berries
15 would you be allowed to eat?

16 A. Well, if my estimate of 70 grams of
17 berries was that estimate of the number of berries that
18 would carry with them the daily acceptable intake
19 amount.

20 Now, that derivation included the
21 hundred-fold safety factor. If there was no safety
22 factor, of course, it would be 100 times higher which
23 would be 70 times 100 is 70,000, which would be about 7
24 kilos of berries I guess.

25 Q. All right, so in that case then, if

1 you ate -- why don't you just work that out.

2 A. 70 times a hundred, 7,000 grams,
3 which would be 7 kilos, right.

4 Q. Seven kilos which is over 15 pounds?

5 A. That's a lot of berries.

6 Q. All right. If you had a 50-fold
7 safety factor.

8 A. Yes.

9 Q. Theoretically then -- not
10 theoretically, based on the way they calculate that, if
11 you ate half of that, you had a 50-fold safety factor
12 and you ate seven and a half pounds of berries a day,
13 there would be no observable effect?

14 A. Well, that's --

15 Q. Not from the berries, but from the
16 2,4-D that may be on the berries.

17 A. Yes, I'm sorry. That would be my --
18 I feel that's a reasonable estimate because the NOEL
19 itself was based on a two-year mammalian study looking
20 for sublethal effects.

21 And so I would anticipate that for
22 short-term consumption with a lesser safety factor
23 applied that that would be a top tolerable consumption.

24 MADAM CHAIR: Can we just go over that
25 for a minute. Your evidence yesterday was that 70 --

1 was it 70 grams?

2 MR. CRAIG: 70 grams of berries per day.

3 MADAM CHAIR: Per day would be -- what
4 level was that; that was not the NOEL level?

5 MR. CRAIG: No, that was calculated based
6 on the daily acceptable intake value, because the daily
7 acceptable intake value is expressed on a per kilogram
8 of body weight.

9 MADAM CHAIR: Right.

10 MR. CRAIG: So I had to include the
11 average -- the weight of an average human.

12 MADAM CHAIR: So you're now saying that
13 the seven kilos of berries would be the hundred times
14 factor, the safety -- not the safety factor, but the
15 difference between the NOEL and the approved daily
16 intake value?

17 MR. CRAIG: That's right. The NOEL is
18 based on a one or two-year rat study and my
19 understanding of what the EPA does is they say: Well,
20 to protect against longer term exposure and allow for
21 daily consumption for a lifetime that it's only
22 reasonable to add an additional safety factor and their
23 convention has been that, in this case, they use the
24 100-fold factor, and I'm not clear on the criteria used
25 to select the 100-fold but that is the approach, as I

1 understand it.

2 MADAM CHAIR: Well, the evidence before
3 the Board is that the EPA has not found the rat study
4 to be acceptable for 2,4-D, the Ministry of the
5 Environment has.

6 MR. CRAIG: Yes.

7 MADAM CHAIR: But the other evidence that
8 we heard - and I don't expect you to be able to -- say
9 if you can't comment on this.

10 MR. CRAIG: All right.

11 MADAM CHAIR: But we've also heard with
12 the EPA they often look towards the OHSA, the
13 Occupational Health and Safety Administration worker
14 exposure levels as being an indication of the maximum
15 exposure that would certainly protect the general
16 population if a safety factor were applied to that.

17 I think that would be quite a different
18 number than we have, using this sort of calculation for
19 the risk assessment we're talking about.

20 MR. CRAIG: Could be. I don't know
21 offhand, I'm just not familiar with that data.

22 MADAM CHAIR: Thank you.

23 MR. MARTEL: Can I just ask a question.
24 I thought at the beginning you said that 70 grams per
25 day for daily acceptable intake included the

1 hundred-fold safety factor in the calculation?

2 MR. CRAIG: I did, yes.

3 MR. MARTEL: Did I not just understand
4 you to tell Mrs. Koven no, that wasn't the case, the
5 NOEL was then built in?

6 DR. EEDY: The NOEL doesn't have the
7 hundred.

8 MR. MARTEL: It doesn't have the hundred.

9 MR. CRAIG: No, that is the foundation
10 number that is used and to which the hundred-fold
11 tsafety factor is applied.

12 MR. FREIDIN: Q. Mr. Craig, perhaps if we
13 did it this way. If you did an equation, if you took
14 the NOEL which is the no observable effect level.

15 MR. CRAIG: A. Right.

16 Q. And you put that over the safety
17 factor, in this case a hundred, that would equal the
18 acceptable daily intake?

19 A. That's correct.

20 Q. So that in a case again, if the NOEL
21 in your case -- if the acceptable daily intake is 70
22 grams then, putting the numbers into this equation, and
23 the safety factor is a hundred, the no observable
24 effect level would be 7,000 grams.

25 A. That's right, and that was assuming

1 that the berries would carry a certain amount of 2,4-D.

2 Q. And what does it mean that the
3 normal -- pardon me, the no observable effect level is
4 7,000 grams, what does that mean?

5 A. Well, with regard to the studies of
6 2,4-D--

7 Q. Yes.

8 A. --let's just focus on that.

9 Q. That's all I'm talking about.

10 A. Because we have made some assumptions
11 concerning the levels of 2,4-D on these hypothetical
12 berries.

13 Q. That's fine.

14 A. But the NOEL in a typical mammalian
15 study would be one of the several exposure
16 concentrations that No. 1 had no observable effect,
17 whatever that effect was going to be, whether it be
18 productive or physiological dysfunction whatever, I'm
19 not clear on what effects were looked for, but there
20 would be a number of incremental feeding concentrations
21 and at some concentrations there would be a response,
22 as I've discussed earlier in my evidence, and at
23 progressively lower concentrations there would either
24 be less of a response or no response.

25 So if one looks at the lower

1 concentrations and identifies no response
2 concentrations, the concentration that is the highest -
3 and that is the highest no effect concentration - that
4 then is considered the NOEL, and it's generally the
5 test of concentration.

6 Q. Mr. Craig, you did some calculations
7 when you were being questioned about Exhibit 1261 which
8 was one of those earthworm studies, the one from the
9 Soviet Union.

10 A. Yes.

11 Q. And you indicated in relation to
12 carbaryl, you said they used 3 kilograms, and in that
13 case that would be 3.5 times higher than the approved
14 rate, and then you said in one case they used 5
15 kilograms and that was 6 times higher than the approved
16 rate.

17 When you were referring to the approved
18 rate, which approved rate were you referring to?
19 I assume it was the approved rate of carbaryl, I just
20 want to know where -- which jurisdiction?

21 A. Yeah, that's the one I'm looking for.

22 Q. You're looking on page 509 of the
23 exhibit, if that helps you.

24 A. Yeah. I made some calculations, so I
25 could refer specifically to the numbers I was using.

1 Q. Oh I see.

2 A. That's why I did the... Yes, I was
3 looking at the normal Ontario use rate of .85 kilograms
4 per hectare.

5 Q. Thank you.

6 MADAM CHAIR: Mr. Craig, could you repeat
7 the rate you just referred to?

8 MR. CRAIG: Yes, yes. When I was
9 comparing the rates used in the paper by Voronova,
10 which is Exhibit 1261 I understand, I compared those
11 use rates with the use rate of .85 kilograms per
12 hectare for carbaryl.

13 MR. FREIDIN: Madam Chair, that is the
14 normal rate which is referred to on page 32 of Exhibit
15 604C, if you want to cross-reference that.

16 Q. Mr. Craig, yesterday you were
17 explaining how the one-fifth LD50 often is below the
18 level of zero when you're looking at a graph--

19 MR. CRAIG: A. Yes.

20 Q. --it's zero mortality.

21 A. Yes.

22 Q. You made reference to the "x" and "y"
23 axis. Could you draw the graph that you were referring
24 to; in other words, demonstrate by actually drawing the
25 graph that you were talking about.

1 A. Madam Chair, what I'm referring to
2 in a typical dose response graph is that there would
3 be -- there would be a series of concentrations,
4 increasing concentrations, and these would be exposure
5 concentrations, and against that is plotted the
6 mortality, in this case we're talking about the LD50.

7 And typically at various dose levels one
8 will see there's a top limit of 100 per cent mortality,
9 obviously one will see a number of responses with
10 increasing mortality as the concentration increases.
11 And, as I've mentioned earlier, when this data is
12 collected then a line of best fits develop through
13 these points and this then is the mortality response
14 curve, and one extrapolates a 50 per cent point from
15 that, estimates the concentration to produce 50 per
16 cent mortality, this then is the LD50, as you probably
17 have already been explained several times.

18 In my experience with aquatic
19 toxicology - and I've also worked with mammals and
20 mammalian toxicology, it's been several years ago -
21 what I've found is that this threshold point, which is
22 the estimated zero effect point, can typically be in
23 the order of one-half the LD50, essentially this
24 concentration produced by 50 per cent. This is quite
25 typical.

1 What I've said about the one-fifth is
2 that this would of course be down here and that, in my
3 experience, the one-fifth concentration level is
4 typically well below the threshold of lethality and,
5 therefore -- and could along with other estimates of,
6 for instance, even one-tenth, but one-fifth is not out
7 of line, could represent some estimates of sublethal
8 thresholds because factors of 5 or 10 of the LD50 or
9 the LC50 in the case of fish, quite often represent the
10 NOELs, for instance, for sublethal. So you might see a
11 sublethal response curve fit in like this.

12 Q. And you're drawing the sublethal
13 curve by a broken line. Perhaps you could just mark
14 these.

15 A. I'll just label the lethal curve and
16 this would be a sublethal curve. And so that's what I
17 am saying, that one-fifth is typically well below the
18 estimate of the zero mortality and quite often could be
19 even low on some of the sublethal curves, but one must
20 really develop the sublethal dose response
21 relationships in order to make these quantifiable
22 relationships, but one-fifth is well within the range
23 of the lower end of sublethal effects in general.

24 MR. FREIDIN: Can we mark that as an
25 exhibit, Madam Chair.

1 MADAM CHAIR: Yes. That would be Exhibit
2 1266.

3 ---EXHIBIT NO. 1266: Hand-drawn diagram prepared by
4 Mr. Craig depicting general dose
response relationships.

5 MR. FREIDIN: Q. What should we call
6 that, Mr. Craig?

7 MR. CRAIG: A. This would be dose
8 response relationships -- general dose response
9 relationships.

10 Q. Okay, thank you.

11 Just a few more questions, gentlemen.
12 Mr. Craig, Ms. Kleer asked if a risk to human health --
13 where there would be a risk to human health if one eats
14 blueberries sprayed with 2,4-D.

15 Do you have Exhibit 665, it is a paper
16 that deals with residues of 2,4-D amongst other --

17 MR. CRAIG: A. Yes, I have 665, I have
18 that.

19 MR. CASSIDY: Madam Chair, you may recall
20 that when Ms. Kleer asked these questions I did not
21 object -- notwithstanding the general thrust of the
22 question was aimed at human health, I didn't object
23 because the question was going more to what was in the
24 berries as to what ended up in the human, and I trust
25 that Mr. Freidin will have the same criteria in mind in

1 these questions, because otherwise he's missed his
2 boat, it should have been dealt with by Panel 9B.

3 MR. FREIDIN: Good.

4 Q. If I've missed the boat, Mr. Craig,
5 you tell me, or if it's outside your area of expertise,
6 but she was concerned about that question.

7 If you look at the summary and go down to
8 almost the end of the first paragraph of the summary
9 where it says, "Of the approximately..."

10 MR. CRAIG: A. I see that.

11 Q. It says:

12 "Of the approximately 1-million hectares
13 of raspberries and blueberries growing
14 wild in the Province of Ontario, about
15 0.3 per cent is treated annually with
16 herbicide, that the timing of
17 applications ranging from flowering to
18 fruiting, only 50 per cent of the fruit
19 from the treated areas would have
20 residues above 0.5 milligrams per
21 kilogram."

22 I'm just wondering whether you can assist
23 whether that has any bearing on the issue of concern
24 raised by Ms. Kleer and, if so, what?

25 A. Well, I would compare the residues on

1 berries, and this identifies 50 per cent of the fruit
2 would have residues above .5 and I compare the .5 with
3 the acceptable daily intake level and that is the basis
4 of comparison that I would make.

5 That would then allow one to calculate
6 the maximum consumption of berries, given let's say .5
7 milligram per kilogram residue, and go through
8 essentially the same calculation as I have done to
9 estimate the total mass of berries that could be
10 consumed on a daily basis. That is a mathematical
11 calculation.

12 I'm trying to remember. I believe when
13 we went through our calculation we were assuming 10
14 milligrams per kilogram -- 10 milligrams of 2,4-D per
15 kilogram, which is 20 times higher than this average
16 value .5.

17 So I would think that the mass of berries
18 that could be consumed, let's say 50 per cent that are
19 below the .5, would certainly allow as much as 20 times
20 more berry consumption than the exercise we went
21 through. So that would increase it by, to what, 140
22 grams for an average individual per day.

23 Q. And would the fact that 0.3 per cent
24 of the raspberries and blueberries growing wild are
25 treated annually, does that have any relevance to

1 determining the extent to which the population at large
2 would be exposed to 2,4-D?

3 A. Well, that would -- that indicates
4 that conversely there are -- 98.7 per cent of the fruit
5 is not treated.

6 Q. Thank you.

7 MADAM CHAIR: You mean 99?

8 MR. CRAIG: What did I say, 98?

9 MADAM CHAIR: You mean 99.7?

10 MR. CRAIG: 99.7. Correct again, Madam
11 Chair.

12 MR. FREIDIN: Thank you. The second last
13 question, and I don't think it would be a real
14 question.

15 Madam Chair, there was some discussion
16 about how many berries a bear eats and no one could
17 find a reference. I couldn't go to sleep last night
18 without finding at least one reference to it, and I'll
19 just direct your attention to page 7-9 and 7-10 of the
20 Weeks report which is Exhibit 1233.

21 MADAM CHAIR: What page is that, Mr.
22 Freidin?

23 MR. FREIDIN: 7-9.

24 MADAM CHAIR: All right.

25 MR. FREIDIN: Under the heading Ingestion

1 Doses you'll note in the fourth line Weeks states:

2 "Diets may vary from season to season and
3 across the species range the diet items
4 and amounts were chosen to be a
5 reasonable representation of what an
6 individual animal might consume on a
7 given day."

8 And if you look at Table 7-4 on the next
9 page there are estimates of the amount of various types
10 of foods that various kinds of animals consume, and
11 there's an entry for black bear. So I just thought I
12 would bring that to your attention.

13 Q. Okay. Dr. Schiefer, I gave you
14 during the break a copy of Appendix No. 4 from MNR's
15 Panel No. 7 witness statement.

16 MR. FREIDIN: I don't remember the
17 exhibit number, but here's a copy just so you can
18 follow along, Madam Chair. (handed)

19 MADAM CHAIR: Thank you.

20 Q. And in your evidence, Dr. Schiefer,
21 you indicated that -- turn to page 15 -- pardon me,
22 page 18 of your witness statement. There was some
23 discussion about the type of information one might want
24 to collect or one might be able to collect in relation
25 to soils so that one could make a more refined

1 site-specific decision as to the width of a reserve,
2 and the bottom of page 18 you describe the number of
3 things that one might obtain information about.

4 Starting five lines up from the bottom:

5 "The buffer zones recommended in the
6 guidelines are based entirely on slope
7 while other consideration such as soil
8 type, moisture retention, ground
9 vegetation, canopy cover, et cetera, that
10 should be considered in determining
11 appropriate buffer zone widths for
12 specific sites."

13 And in relation to that I think you gave
14 an estimate of a thousand dollars per 10-hectare lake
15 to collect that information; is that correct?

16 DR. SCHIEFER: A. I believe the response
17 I gave was that it would cost, as an estimate, a
18 thousand dollars to do a 10-hectare lake.

19 Q. A 10-hectare lake.

20 A. Right.

21 Q. And I think you also indicated if it
22 was a hundred hectare lake it would be, just
23 approximately, 10 times the cost; if it was a thousand
24 it would be a hundred times the cost, et cetera. Did I
25 understand your evidence correctly in that regard?

1 A. Well, there would be an increase in
2 cost as the size of the lake or the number of lakes
3 increased. I don't think I suggested it was
4 necessarily a linear increase.

5 Q. Are you able to estimate, to give any
6 estimation as to what it would be, what the increase
7 would be?

8 MR. CASSIDY: Of what?

9 MR. FREIDIN: Q. If it's not linear -- I
10 want to do a calculation to see how much this might
11 cost.

12 DR. SCHIEFER: A. Yes.

13 Q. As you know, it's easy to do a linear
14 one.

15 A. Well, if we could proceed with your
16 calculation--

17 Q. All right.

18 A. --I think there's merit in doing it.

19 Q. Okay, why don't you flip -- I've done
20 it on the flip chart here. You got it, you got. No,
21 no, just you had the right spot right there.

22 A. Which page would you like to see?

23 Q. Go to the first page, or that one.

24 A. Here, this one.

25 Q. Yes. Now, Appendix 4, Dr. Schiefer,

1 is a description of the number of lakes by three lakes
2 sizes in the area of the undertaking from Cox Counts
3 and Measurements of Ontario Lakes from the Fisheries
4 Branch of the Ontario Ministry of Natural Resources.

5 Do you recognize Cox as a reliable source
6 for that type of information?

7 A. Yes, I do.

8 Q. And the flip chart that is up there -
9 now, you have seen this - and can you confirm at least
10 that if the numbers in the first three columns are
11 correct whether the average surface area in hectares is
12 correct in the fourth column? Do you understand my
13 question?

14 A. Well, I would like to know how you
15 arrived at the average surface area.

16 Q. All right. Let's assume that the
17 total surface area in hectares is taken directly from
18 Cox.

19 A. Okay.

20 Q. Then if that's where it comes from it
21 would be an acceptable source?

22 A. That's correct.

23 Q. All right. And if that's what -- and
24 I'm telling you that my information is that that is
25 what it is, is the calculation -- the mathematical

1 calculation of the average surface area of the various
2 lake size ranges shown in the left-hand column an
3 accurate calculation of the average surface area?

4 A. It would appear to be correct.

5 Q. And it's my information that that is
6 based on Cox for all lakes in Ontario and not just the
7 area of the undertaking.

8 MR. FREIDIN: Subject to proof, Madam
9 Chair, could we mark that as the next exhibit?

10 MADAM CHAIR: What was the point of this,
11 Mr. Freidin?

12 MR. FREIDIN: The point will become
13 apparent I think by the next exhibit.

14 DR. SCHIEFER: What is the number?

15 MADAM CHAIR: That is Exhibit No. 1267.

16 MR. FREIDIN: We might as well mark it --
17 can we make that A?

18 MADAM CHAIR: A.

19 ---EXHIBIT NO. 1267A: Hand-drawn diagram depicting
20 numbers and sizes of lakes based
21 on information obtained from Cox
22 Counts and Measurements of
Ontario Lakes from the Fisheries
Branch of the Ontario Ministry of
Natural Resources.

23 MR. FREIDIN: Q. So in effect we have --
24 that information comes from Cox. Just to read that,
25 there are lakes in the range of 1 to 9.9 hectares in

1 Ontario, there are 88,836 of them, the total surface
2 area of them are as indicated, and the average size,
3 therefore, is 3.99 hectares. That's the way you would
4 read that?

5 DR. SCHIEFER: A. (nodding affirmatively)

6 Q. If we flip the page back -- is that
7 correct, Dr. Schiefer?

8 A. That's correct.

9 Q. Could we flip it back one more sheet.

10 MADAM CHAIR: Mr. Freidin, remind me
11 again about the Cox source?

12 MR. FREIDIN: Oh, the Cox -- as you note
13 from the excerpts here, Appendix 4, it's a document
14 prepared by Ministry of Natural Resources of 114 pages
15 that Mr. Hogg is -- or I am holding up for you right
16 now, which in fact has information on the number and
17 the measurement of Ontario lakes.

18 MADAM CHAIR: Is that an exhibit?

19 MR. FREIDIN: No. This information is
20 Appendix No. 4, was Mr. Neville Ward's -- he took from
21 Cox only those lakes which were in the area of the
22 undertaking.

23 MADAM CHAIR: Right, and what exhibit
24 number did Appendix 4 get?

25 MR. FREIDIN: Appendix 4 was -- I'll give

1 the exhibit number, it was part of the -- whatever
2 exhibit volume --

3 MS. SEABORN: It starts at page 538 of
4 the Panel 7 witness statement.

5 MR. FREIDIN: Right. So it's MNR's Panel
6 No. 7 witness statement, Volume II, and Appendix 4 that
7 you've got is pages 538 to 542. I just don't have the
8 exhibit number, I'm sorry.

9 MADAM CHAIR: Thank you.

10 MR. FREIDIN: Q. Now, the next sheet
11 that I have up there, again, can you confirm for me
12 that what that document shows, it takes the same lake
13 size ranges, it takes the average surface area as shown
14 on Exhibit 1267A, and it ascribes an average cost per
15 lake. Now, let's just stop there.

16 The average cost per lake that I -- is
17 that calculated in a linear fashion based on your
18 evidence of a thousand dollars per 10-hectare lake?

19 DR. SCHIEFER: A. Yes, it appears to me
20 that you've divided the thousand dollars by 10 to come
21 up with a \$100 per hectare cost as the basis for
22 extrapolation.

23 Q. And the mathematics on this table is
24 correct?

25 A. They appear to be, yes.

1 Q. All right. Those numbers show to me
2 that if there is a linear progression in terms of the
3 cost of collecting information that you referred to on
4 page 18 of the witnesses statement based on your
5 evidence of a thousand dollars per 10-hectare lake, or
6 for each 10-hectare lake or a 10-hectare lake.

7 A. Right.

8 Q. That the total cost of doing or
9 obtaining that information, based on your estimated
10 cost, for all of the lakes in the area of the
11 undertaking in the size ranges indicated, would be
12 \$435-million.

13 Could you comment on the validity of the
14 calculation?

15 A. The calculation carried out in that
16 manner - at least my quick mathematics - does result in
17 that total cost. The factor I would like to point out
18 is that the criteria we are evaluating are shoreline
19 features and so really it's more the circumference of
20 the lake that is a factor than is the area of the lake,
21 and generally the circumference of a lake increases
22 only at a 30 per cent -- roughly a 30, 35 per cent
23 ratio with the area. As a lake increases in area, the
24 circumference does not increase in a linear manner.

25 Q. Okay.

1 A. So that we just did a quick exercise
2 trying to look at it on a per unit basis as well, so
3 that instead of \$100 per hectare surface area you could
4 prorate that cost estimate I gave to an equivalent of
5 \$1 per linear metre of shoreline. So we are relating
6 the cost for the 10-hectare lake to the circumference
7 of the shoreline.

8 Q. Sure.

9 A. It's an extrapolation, however, if
10 you carry that calculation through--

11 Q. Yes.

12 A. --it would result in approximately
13 one third of that cost.

14 Q. Which is...?

15 A. Which is approximately 150-million.

16 Q. Do you want to write 150-million on
17 there with a different coloured pen. 150-million. Why
18 don't you put down there, based on --

19 MR. CRAIG: A. Circumference.

20 Q. Circumference. Dr. Schiefer, we
21 heard evidence that -- would you agree that the Fish
22 Habitat Guidelines require reserves or recommend
23 reserves around waterbodies other than just lakes?

24 A. That's correct.

25 Q. And so if we did a calculation about

1 streams, that number would increase?

2 A. That would apply to lakes, although I
3 would like to modify it somewhat further, if I could.

4 Q. Sure.

5 A. Since you are working on my estimate
6 of the cost, that table includes all lakes from a one
7 hectare size up. The guidelines, as I understand them,
8 apply only to lakes of 10-hectares and larger, with the
9 exception of headwater lakes.

10 So in fact that first category, the 1 to
11 9.9 hectare size, the cost to do that category of lake
12 would be substantially less.

13 Q. Sure. So if we just removed it
14 completely we'd go from 150 down to --

15 A. Well, it would be a third of that,
16 so...

17 Q. A third of that. All right.

18 A. We would save \$10-million.

19 Q. Okay. I'm just trying to get the
20 order of magnitude.

21 A. I understand, I understand.

22 Q. And I'm glad that you're qualifying
23 this. But if we are going to do streams, the numbers
24 would go back up?

25 A. They certainly would.

1 MR. FREIDIN: What do we want to call
2 this? We will make it Exhibit 1267B, but Estimated
3 Cost for --

4 DR. SCHIEFER: 1267B.

5 MR. FREIDIN: Yes. Estimated cost for
6 additional shoreline information?

7 DR. SCHIEFER: For--

8 MR. FREIDIN: Additional shoreline --

9 DR. SCHIEFER: For shoreline surveys.

10 MR. FREIDIN: For shoreline surveys,
11 okay.

12 MR. CASSIDY: Why not lake surveys?

13 MR. FREIDIN: No, no, it's not a lake
14 survey, I don't want to confuse you with that. Can we
15 just say shoreline information?

16 MR. CASSIDY: Sure.

17 MADAM CHAIR: And this was for the
18 purpose of deciding whether to implement guidelines?

19 DR. EEDY: Buffer zone calculations.

20 ---EXHIBIT NO. 1267B: Hand-drawn diagram depicting
21 shoreline information.

22 MR. FREIDIN: Q. And my last question
23 for you as a panel, and I want a yes or no answer --

24 MR. CASSIDY: Well --

25 MR. FREIDIN: Well, all right, subject to

1 that.

2 Q. Assuming that the Ministry or
3 somebody was going to in fact carry out all that
4 activity at that cost, would Beak like the contract?

5 MR. CASSIDY: Don't answer that.

6 MR. FREIDIN: Okay. You don't have to
7 answer.

8 MR. SCHIEFER: Well, I'd like to provide
9 a partial answer because this is the kind of problem
10 that we are normally addressing for our clients. There
11 is a magnitude of an undertaking and there is a need
12 to, in a cost-effective way, address that requirement.

13 I don't dispute the number of lakes,
14 their average size, their circumference and area and
15 adding streams for an area the size of the undertaking
16 is a substantial amount of work. The order of
17 magnitude I wouldn't argue with; however, I mean, there
18 are ways of focusing that work.

19 If you have 10 10-hectares lakes that has
20 the headwaters in one particular watershed, the nature
21 in which you address that would not necessarily be 10
22 times the effort you would put into one. You may do it
23 on-a representative lake basis assuming primary
24 features are similar, you would use aerial photography,
25 in fact focus that type of work into where critical

1 habitats or more important habitats or representative
2 habitats were.

3 So there are ways of focusing and dealing
4 with subsets of representative habitats to reduce the
5 effort, but I certainly agree the effort is a very
6 large one.

7 MR. FREIDIN: Thank you. Those are my
8 questions, Madam Chair.

9 MADAM CHAIR: Thank you, Mr. Freidin.
10 How long are you going to be, Ms.
11 Seaborn?

12 MS. SEABORN: I think just a few minutes,
13 Madam Chair.

14 MADAM CHAIR: Mr. Cassidy, is it more
15 convenient for you to have a break between your
16 re-examination and Ms. Seaborn's...

17 MR. CASSIDY: No, I'd be -- unless Ms.
18 Seaborn shocks me with something I haven't heard to
19 date, I'm prepared to go immediately following her.

20 MS. SEABORN: I always like to try and
21 shock Mr. Cassidy, but I am prepared to go.

22 MADAM CHAIR: Why don't we do the
23 cross-examination of Ms. Seaborn, take a short break,
24 and do Mr. Cassidy.

25 MR. CASSIDY: I can advise I'll be less

1 than half an hour.

2 MADAM CHAIR: Okay.

3 MS. SEABORN: Madam Chair, I would like
4 to begin by filing a number of Ministry of the
5 Environment interrogatories. For the record, these are
6 questions asked in relation to Panel 9A and they are
7 Questions 1, 2, 4, 5, 7, 8, and 9.

8 MR. SUTTERFIELD: (handed)

9 MADAM CHAIR: Mr. Sutterfield -- excuse
10 me, Mr. Sutterfield, could we have one more copy,
11 please.

12 MR. SUTTERFIELD: Sorry. (handed)

13 MADAM CHAIR: Thank you. That will be
14 Exhibit No. 1268.

15 MS. SEABORN: Thank you.

16 ---EXHIBIT NO. 1268: MOE Interrogatory Nos. 1, 2, 4,
17 5, 7, 8, and 9 re OFIA/OLMA Panel
9A.

18 CROSS-EXAMINATION BY MS. SEABORN:

19 Q. Dr. Schiefer, if I could just follow
20 up for a moment on the questions in relation to the
21 cost. Can you confirm for me that the cost figures
22 that we were discussing would relate only to the
23 gathering of additional terrestrial data in relation to
24 shorelines?

25 DR. SCHIEFER: A. The majority of it

1 would be terrestrial, but there would be some
2 requirement to identify critical habitats; for
3 instance, spawning habitats.

4 Q. That wasn't my -- I don't think that
5 was my question though. When Mr. Lindgren first
6 brought this topic up I believe he asked you what would
7 be the cost to gather the additional data that you
8 referred to in your evidence statement, and Mr. Freidin
9 then has gone ahead and extrapolated those figures as
10 set out in the exhibits on the flip chart.

11 And what I'm asking for you to confirm
12 for me, that in those figures and in that extrapolation
13 there's no consideration of the aquatic inventory data
14 that may also have to be gathered in any event?

15 A. That's correct, Ms. Seaborn.

16 Q. Okay, thank you. And so that in
17 terms of the question that the Board asked during Mr.
18 Freidin's cross-examination about the cost of
19 implementing the Fish Habitat Guidelines, would you
20 agree with me that that was not the intent of that
21 exercise, to show the cost of implementing those
22 guidelines; the intent was to show the cost of
23 gathering additional data?

24 A. Yes.

25 Q. Thank you. Now, you also said in

1 your witness statement, Dr. Schiefer, that the
2 scientific community does not have sufficient
3 understanding of ecosystem functions to define a
4 universal decision tree that would cover all possible
5 scenarios and site conditions. Do you recall that
6 evidence?

7 A. Yes, I do.

8 Q. And assuming that we had all the
9 information in relation to terrestrial data that you
10 have referred to in your witness statement, and we have
11 a particular waterbody in mind, how would you actually
12 prescribe a specific width or a buffer zone after you
13 had that information; could you give me a number?

14 A. A number for the width?

15 Q. Yes.

16 A. Well, I think most of that
17 information we would want to put into basically a
18 simulation model to determine what the probability or
19 the likelihood of a particular effect occurring based
20 on a number of scenarios, for instance, a particular
21 rainfall event in the case of erosion.

22 Q. And, in your opinion, do we currently
23 have those models available for use in Ontario?

24 A. Not that I'm aware of, to the degree
25 where we could fully integrate all of that type of

1 information, but the model we are currently using, for
2 instance, habitat suitability effects models for
3 various fish species, now accommodate a significant
4 amount of that type of information.

5 Q. Okay. And would you agree then that
6 on an operational basis then, that even if we had the
7 funds and the time to go out and collect a lot of
8 additional data, there isn't, as you've said in your
9 evidence, this universal decision tree available right
10 now where we can plug that data into a model and be
11 able then to prescribe a new set of buffers that we
12 could use across the area of the undertaking?

13 A. No, not to fully integrate all of
14 that type of information; however, for instance, the
15 value in knowing -- well, let's use one example.

16 Soil erodability, if instead of just
17 using a criteria, slope, one also used just the other
18 factor of soil erodability, it might significantly
19 affect the decision you would make in terms of the
20 appropriateness of a buffer zone width.

21 Q. But in terms of the appropriateness
22 of a width, if you don't have a model to plug that
23 information into, how could you come up with any
24 different width than what we already have set out in
25 the guidelines as they currently exist?

1 A.- This may sound unusual, but I guess I
2 have to go back to some of the cross-examination that
3 Mr. Hanna was involved in. He pointed out some
4 relatively simple graphic relationships, I guess it was
5 a simple monograph.

6 And models need -- I mean, models range
7 from being very simple sort of two-factor relationships
8 to being very complex, multi-factored mathematical
9 formulae. It may well be that a simple - just carrying
10 this example through - a simple relationship between
11 slope and soil erodability, that very simple model,
12 that very simple two-factor relationship would provide
13 you with criteria for an appropriate buffer zone width.

14 As you add criteria you would increase
15 the sophistication of that particular model to the
16 point where the information would continue to be
17 better, but it may never be perfect.

18 Q. Okay.

19 MADAM CHAIR: Dr. Schiefer, in the
20 guidelines now with respect to the size of the slope
21 versus the sizes of the buffer, we have in essence a
22 very simple relationship, I mean you could call that a
23 model if you wanted in terms of having only two
24 factors.

25 DR. SCHIEFER: Absolutely, Madam Chair,

1 it is a model.

2 DR. EEDY: I think, you know, as one
3 progresses the next step up might be to get involved in
4 something like the universal soil/rocks equation which
5 includes not only the slope but also includes things
6 like the texture of the soil. You know, it gets a
7 little more complex, it's a little more costly to
8 determine, but it also gives a little more accurate
9 information.

10 So you have to look at whether the
11 accuracy is that much greater and significant to what
12 decision you're making as to the cost of gathering
13 information.

14 MADAM CHAIR: Do you become more
15 comfortable -- Dr. Schiefer, with the more factors you
16 put into a model, do you think that replaces in any way
17 the decision not to be overconservative in applying a
18 model? Does that replace the need to do a visit, does
19 that give you more confidence that you're not over
20 using a buffer?

21 DR. SCHIEFER: Well, I think that as you
22 apply relevant criteria, I mean one can also go to the
23 extreme and be trying to collect everything, but as you
24 collect relevant information the decisions you make
25 based on the use of that information is inherently

1 better.

2 In this case I guess I have to qualify
3 better. In this case better may mean prescribing a
4 buffer that adequately protects the aquatic environment
5 without constraining -- unnecessarily constraining
6 other resource uses. It goes back to the concept of
7 being conservative.

8 There is nothing inherently wrong with
9 being conservative in terms of protecting aquatic
10 resources, unless the degree to which you are
11 conservative, because you're using a very simple factor
12 determination in defining why you need that wide a
13 buffer zone, unless the associated disbenefit costs, in
14 this case the timber resource, is very large.

15 MADAM CHAIR: But you're not saying at
16 the same time that the more complicated and
17 multi-factorial model might be -- you don't have any
18 more confidence necessarily in a model like that to
19 have the guidelines implemented in a flexible way; it
20 could work to -- it could work in a very opposite
21 sense, people would feel that a very complicated model
22 would give you a more accurate picture of whether or
23 not a buffer were needed in any particular situation.

24 DR. SCHIEFER: It may clearly. If -- for
25 instance, in monitoring the application of buffer zone

1 decisions which are made strictly on the slope
2 criteria, if the monitoring program found that in some
3 circumstances that buffer didn't work because soils in
4 that particular location were excessively erodible,
5 that in fact the buffer zone determined strictly on
6 slope was inadequate there should have been a
7 consideration for the fact that this soil, you know,
8 has the ability to slump with very little additional
9 moisture, in fact the buffer zone prescription should
10 have been larger.

11 The more information you have of the
12 criteria for just slope being inadequate to accurately
13 address the concern for protecting aquatic resources,
14 the more tendency there will be to in fact not have
15 confidence in them, and whether that leads to the need
16 for more and more specific site application to avoid
17 circumstances where they are inadequate, I guess I
18 can't comment on, but...

19 MADAM CHAIR: Well, this issue that we
20 are talking about has been before the Board since Panel
21 1 of this entire case; and, that is, do you put
22 confidence in the expert opinion and experience of
23 people who work as foresters, who understand what's
24 going on in the forest, or do you somehow replace that
25 with models, whatever they may be, in terms of having

1 information that can be used in a more mechanical way,
2 and it's not the just on the issue of buffers that we
3 come across this situation.

4 DR. SCHIEFER: Yes.

5 MADAM CHAIR: In each of the areas we
6 have looked at we've had to look very carefully at
7 those two approaches.

8 DR. SCHIEFER: Madam Chair, I would never
9 be one to prescribe replacing expert judgment and
10 site-specific field application with models; however, I
11 would like to think that we have the ability to use
12 technologies that are being developed and proven to be
13 very useful tools to improve our ability to make these
14 site-specific prescriptions.

15 I would like to think that we have
16 progressed from the point of a biologist or a forester
17 doing the same thing today as he did in 1925. We have
18 technologies, we have satellite imagery, we have GIS
19 computer systems. I'm not suggesting they replace the
20 need for that professional opinion, but they provide an
21 extremely useful and powerful tool to that individual
22 to make more appropriate decisions.

23 Obviously there's a balance needed
24 between the two.

25 MADAM CHAIR: Ms. Seaborn.

1 MS. SEABORN: Q. Dr. Schiefer, you have
2 not in your evidence though, on behalf of Beak
3 Consultants and on behalf of the Industry, put forward
4 another model in terms of how we deal with water
5 quality and fish habitat concerns; have you?

6 You referred back to Mr. Hanna's
7 cross-examination, you have not come forward to the
8 Board and explained in evidence what sort of model you
9 would see being put into place in order to design
10 buffers in a way that is different than what has been
11 proposed to the Board to date?

12 DR. SCHIEFER: A. We have not
13 recommended a specific model, that's right.

14 Q. And that wasn't part of your mandate,
15 I take it?

16 A. No, it was not.

17 Q. And I would like you to have a look
18 at the OFIA/OLMA terms and conditions.

19 MS. SEABORN: Madam Chair, those should
20 be in front of you.

21 MADAM CHAIR: Which?

22 MS. SEABORN: They have a buff cover.
23 I'm not sure if they have an exhibit number yet. I
24 believe we were going to wait and give them all a
25 number at the outset of Panel 10.

1 Q. And if you could turn to page 47 of
2 the terms and conditions. Do you have that in front of
3 you, Dr. Schiefer?

4 DR. SCHIEFER: A. No, I don't, sorry.
5 I'm afraid --

6 Q. I think they were on my list for
7 everyone. Would you just read that term and condition
8 over.

9 A. Term and condition 45.

10 Q. Yes, just read that over to yourself.

11 MADAM CHAIR: Mr. Cassidy, I assume
12 you've memorized all the terms and conditions from that
13 submission.

14 MR. CASSIDY: Do I have to answer that
15 question?

16 MS. SEABORN: I apologize. It appears it
17 was on the list for the Board but not on the list for
18 my friend.

19 MR. CASSIDY: Yes. Well, it wasn't on
20 the list I was given and I don't have it and neither do
21 my witnesses. I know I should really pull out my own
22 terms and conditions, and the one day you don't have
23 them --

24 DR. SCHIEFER: Thank you.

25 MS. SEABORN: Q. Now, Dr. Schiefer, this

1 term and condition is directly in relation to the
2 Timber Management Guidelines and because not everyone
3 has it I'll read it into the record quickly.

4 "OMNR shall collect sufficient fisheries
5 related information in order to apply the
6 Timber Management Guidelines for the
7 Protection of Fish Habitat as amended
8 from time to time. The required
9 information includes fish species
10 present, critical fish habitats (e.g.
11 spawning areas) and the slope of
12 shoreline areas. In the absence of
13 sufficient information, reserves in which
14 no timber management operations will be
15 permitted shall be prescribed or
16 selection harvest may be permitted
17 provided it can be demonstrated that fish
18 habitat would be protected."

19 Now, would you agree with me, Dr.

20 Schiefer, that this term and condition is consistent
21 with MNR's policy that implements the Fish Habitat
22 Guidelines?

23 DR. SCHIEFER: A. Yes, it is.

24 Q. And there's no qualification in the
25 term and condition to the effect that, in some

1 instances, the guidelines may be too conservative or
2 that a different approach in relation to headwater
3 streams should be taken?

4 A. That's correct.

5 Q. And would you agree with me that it
6 would be a reasonable term and condition for this Board
7 to impose that the Fish Habitat Guidelines should be
8 implemented as they are currently written and until we
9 know the results of the effects/effectiveness
10 monitoring program which has been proposed by MNR, and
11 I might add supported by the Industry in their terms
12 and conditions?

13 A. I would agree.

14 MS. SEABORN: Thank you. Those are all
15 my questions.

16 Thank you, Madam Chair.

17 MADAM CHAIR: Thank you, Ms. Seaborn.

18 We will take the afternoon break now, Mr.
19 Cassidy, and be back in 20 minutes.

20 MR. CASSIDY: Thank you.

21 ---Recess taken at 3:00 p.m.

22 ---On resuming at 3:20 a.m.

23 RE-DIRECT EXAMINATION BY MR. CASSIDY:

24 Q. I want to turn to Exhibit 748, Mr.
25 Craig, and I want to go, as did Mr. Castrilli, to page

1 18 of that exhibit.

2 MR. CRAIG: A. Yes, I have that.

3 Q. And the second full paragraph, the
4 second to last sentence in that paragraph --

5 MADAM CHAIR: It was here and now it's
6 gone, Mr. Cassidy.

7 MR. CASSIDY: Does the panel have two
8 copies by any chance?

9 MR. CRAIG: 748.

10 DR. EEDY: What's the title?

11 MR. CASSIDY: Its the Guidance for the
12 Reregistration of Pesticide Products Containing 2,4-D
13 as the Active Ingredient.

14 MR. MARTEL: 748.

15 MR. CASSIDY: Yes, page 18, and we are
16 looking at the second full paragraph.

17 Q. Mr. Castrilli, and also this morning
18 Mr. Freidin, asked about that paragraph and, in
19 particular, Mr. Castrilli referred you to the second to
20 last sentence dealing -- where it states that:

21 "Residues of 2,4-D per se were detected
22 in water six months after treatment."

23 He did not refer you to the next sentence
24 which states that:

25 "In all cases maximum 2,4-D

1 concentrations in water were reached
2 within one day and dissipated rapidly
3 thereafter."

4 I am interested in the word 'dissipated',
5 and I'm interested if you can tell me is there a
6 relationship between that dissipation and that
7 dissipation rate referred to and your dilution concept
8 that you have been discussing in your evidence?

9 MR. CRAIG: A. There would be a
10 relationship, and particularly in flowing streams. The
11 initial reduction in concentrations would primarily be
12 due to dilution and I believe the glyphosate example
13 that was used by Mr. Freidin is a good one and, in that
14 regard, it demonstrated a 80 per cent reduction in a
15 10-hour period which I think -- I believe is a rapid
16 reduction and --

17 Q. Sorry.

18 A. So I think that is -- would be within
19 10 hours, and then within another 10 hours, I would
20 expect a somewhat lower percentage of dissipation
21 again, as the glyphosate example served to show as
22 well, and I would think that that first one day
23 dissipation would primarily be due to dilution and
24 particularly in flowing streams.

25 Q. All right. Are you able to - and

1 this is in respect to the pond size issue raised by Mr.
2 Castrilli - are you able to enumerate for us the
3 factors that would cause the dissipation or dilution of
4 pesticides in pond size or in ponds of various sizes?

5 A. The rate of dispersion would be
6 governed by factors like wind on the surface in order
7 to generate any turbulence on the surface. Typically
8 in small ponds there will be no current unless there
9 was some sort of underwater stream or something like
10 that, but the rate of mixing would be limited to
11 factors such as those, and --

12 Q. Is flushing time one of those
13 factors?

14 A. Flushing time would contribute to
15 that, that would require the pond would have influent
16 and an effluent current and then the time required for
17 that total volume to flush would go to reducing the
18 concentration in the pond.

19 Q. What about a factor called
20 bathymetry?

21 A. The depth of the pond or the bottom
22 profile of the pond, I'm not clear how that
23 specifically would contribute to it. It would --
24 unless there were thermal currents that would circulate
25 from bottom to top, that would contribute to it.

1 Q. All right. Well, Mr. Martel asked
2 you during the course of the cross-examinations if you
3 could indicate how long it would normally take for a
4 pesticide application on a lake surface to become
5 diluted, and you mentioned dispersion as the mechanism
6 for this effect.

7 And I'm wondering if you can clarify that
8 for me in terms of what are the contributing factors in
9 dispersion that you would look at in terms of
10 estimating the length of time it would take for the
11 dilution?

12 A. Well, factors would be all of those
13 we have discussed; wind surface, disturbance, that
14 would deal with turbulence, any thermal current that
15 might develop during the day from the bottom to the top
16 of the pond, and typically that -- the situation we are
17 referring to here is a five gallon bucket of
18 insecticide tipping into a pond of about -- what was
19 it, half a hectare, .2 hectares surface area. And so
20 that dispersion itself would be limited by all of those
21 factors, and if there were runoff or streams leading
22 into that, that would contribute to that.

23 But I think the critical thing we are
24 referring to at that time was that this would not be an
25 instantaneous mixing process, this would be a very

1 slow -- this would be a somewhat slow process and
2 there would be plenty of opportunity for many animals
3 to avoid this high concentration area and to stay
4 outside those perimeters.

5 MADAM CHAIR: Mr. Craig, if a compound or
6 the substance were odourless and tasteless and were not
7 suspended in some sort of an oil base, would the fish,
8 for example, be likely to stay away from it?

9 MR. CRAIG: They most likely would. They
10 would -- they can respond to chemicals that have odours
11 and taste, that is well-known, but they would primarily
12 respond to it as an irritant particularly as they
13 travelled up a concentration gradient, and this is well
14 recognized in the field and particularly where there
15 have been industrial spills. Fish will swim into that,
16 the edge of that gradient, recognize the irritation,
17 generally it's on their gills also they have sensory
18 organs, the nares of the nose and also the lateral line
19 which is extremely sensitive to physical and chemical
20 stimulæ. They would sense that and they would turn
21 around.

22 So even if the substance was clear and
23 colourless, chemicals of those concentrations would
24 undoubtedly have a irritant characteristic and animals
25 would typically respond by travelling down the gradient

1 into clean water.

2 MR. CASSIDY: Q. If I may move on to
3 Exhibit 1233, Madam Chair, and I'm looking at page 7-12
4 in that, exhibit and once you have found that page in
5 that exhibit I would also ask you to have in front of
6 you, Mr. Craig, page 19 of Exhibit 604C which is the
7 ESSA document.

8 MADAM CHAIR: What page of 1233, Mr.
9 Cassidy?

10 MR. CASSIDY: Page 7-12, Madam Chair.

11 MR. CASSIDY: Q. And page 19 of Exhibit
12 604C which sets out the buffer zones for aerial
13 application of pesticides in Crown forests of Ontario.

14 Dealing first with page 7-12 in Exhibit
15 1233, and I'm looking in the first paragraph on that
16 page, do you see the reference to the -- in the third
17 sentence to:

18 "Typical environmental effect
19 concentrations were based on typical
20 application rates at a distance of 20
21 metres from the application site to the
22 body of water."

23 Do you see that, Mr. Craig?

24 MR. CRAIG: A. I do.

25 Q. Now, do you see on page 19 of Exhibit

1 604C the various buffer zones that are prescribed there
2 on that table?

3 A. Yes, I do.

4 Q. And am I correct that the smallest
5 buffer zone permitted in Ontario according to that
6 table for aerial application of pesticides is 60
7 metres?

8 A. That's correct.

9 Q. Am I, therefore, correct that the
10 environmental effect concentrations discussed in Weeks
11 Exhibit 1233 were based on a distance to water which
12 was one third of what is permitted at the smallest
13 level in Ontario?

14 A. That's correct.

15 Q. Now, I want to move to you, for a
16 minute, Dr. Schiefer. And Mr. Lindgren asked you
17 several questions in cross-examination about your
18 experience and knowledge of the effects of timber
19 harvest practices in Ontario on aquatic ecosystems, and
20 you indicated the breadth of your knowledge in respect
21 of particular effects in other types of undertakings.

22 Can you clarify for me the principles
23 that would be used in looking at those effects in those
24 undertakings, and whether or not those principles are
25 of the same or are not the same application to your

1 study of the effects of harvesting practices on those
2 ecosystems? And I'm talking about the principles.

3 DR. SCHIEFER: A. Yes. Well, what one
4 would normally do is examine the environmental setting
5 of the particular undertaking; in other words, describe
6 the environmental features, the habitat features, the
7 species that exist, their inter-relationships,
8 basically key ecosystem components that might be
9 affected by an undertaking.

10 One then examines the aspects of that
11 undertaking which might affect the pathways of effect
12 which might occur, for instance, anything that might
13 cause erosion, changes in water temperature, regulation
14 of waterflows, that would cause an effect on the
15 aquatic environment. That might relate to any number
16 of types of activities on the land base; agricultural,
17 urban development, Hydro electric development.

18 One then -- using knowledge of the
19 habitat relationships of the species of concern, one
20 would examine the potential for impact and make a
21 decision on the degree of impact expected.

22 I think as I pointed out to Mr. Lindgren
23 one need not specifically study the effects of timber
24 harvesting effects on fish to know that if the
25 relationship of timber harvesting to various factors,

1 like influence on erosion, what that corresponding
2 effect on a particular target species might be in
3 summary. Anyone who examines and has a knowledge of
4 habitat requirements and relationships of primary
5 species in the area of the undertaking can generally
6 assess what the impacts of any undertaking may be, if
7 he knows the kinds of changes that undertaking will
8 have on key aspects or key processes in the ecosystem.

9 Q. Thank you. I would now like to turn
10 to you, Dr. Eedy, and refer you to the
11 cross-examination by Mr. Lindgren with respect to the
12 issue of forest fragmentation.

13 And I would like to ask you if you are
14 aware of any consensus that exists within the
15 scientific community as to exactly what forest
16 fragmentation is?

17 DR. EEDY: A. I certainly looked at this
18 issue and in general most of the references and
19 material on that are not really pertinent to the area
20 of the undertaking, they are more pertinent to areas
21 such as the more heavily populated areas or
22 agricultural areas of the States or of Europe.

23 In general the fragmentation refers to a
24 barrier, whether this barrier is a large area of
25 unusable or difficult to cross habitat, or whether it's

1 something such as a fence or a four-lane highway or a
2 canal or something like this.

3 And my feeling is, and the reason I feel
4 it isn't particularly pertinent to what we are studying
5 in this particular case, is that I don't believe that
6 the activities of the undertaking, although in some
7 cases they may result in an unpreferred habitat, that
8 they result in a habitat which is a barrier to the type
9 of wildlife in Ontario being able to find a usable
10 habitat.

11 Q. Thank you.

12 A. Is that --

13 Q. Yes, thank you. I have one further
14 question for you, Dr. Eedy, on another matter raised by
15 Mr. Lindgren and also raised by Mr. Freidin this
16 morning in the context of population indexes.

17 And you indicated in discussing with Mr.
18 Lindgren that notwithstanding that a portion of the
19 species found in the area of the undertaking are not
20 fully understood -- I believe your words were, our
21 knowledge is not so constrained so as to interfere with
22 our ability to make good management decisions.

23 And my question to you is: Do you, as a
24 professional wildlife biologist, think it would be
25 prudent to hold off making any management decisions or

1 taking proper management action in the absence of total
2 scientific certainty?

3 A. I certainly don't feel that that
4 would be prudent. I think as I've indicated several
5 times, I don't think any competent scientist would ever
6 say that one is satisfied that one has reached a point
7 of a hundred per cent certainty in any matter because
8 the scientific method is basically -- the principle is
9 that one is never a hundred per cent sure and one is
10 always trying to gain more knowledge to refine your
11 hypothesis and to get closer to that assurance, and I
12 think there is sort of a law of diminishing return, you
13 have sort of an asincotic curve where you do really get
14 to a point where it's really not cost effective to put
15 a lot of effort into trying to get better, but you
16 never do reach the point of knowing everything.

17 I feel that the only way one is going to
18 improve our knowledge and improve our management
19 ability is to manage in the way we know best now and to
20 continue investigating to continue monitoring the
21 effects and to continue iteratively improving the
22 management as one goes on. To stop and do nothing
23 would get us nowhere.

24 MR. CASSIDY: And those, Madam Chair, are
25 my questions.

1 MADAM CHAIR: Thank you very much, Mr.
2 Cassidy.

3 You have vied with the Ministry of the
4 Environment for fastest --

5 MR. CASSIDY: Most efficient.

6 MADAM CHAIR: That's right,
7 re-examination.

8 MR. CASSIDY: Thank you.

9 MADAM CHAIR: Good. Thank you very much.

10 MR. CASSIDY: Thank you, Panel.

11 MADAM CHAIR: Thank you very much, Mr.
12 Craig and Dr. Schiefer and Dr. Eedy, and we appreciate
13 you coming before the Board with this evidence and good
14 luck. I assume we won't see you again.

15 Thank you very much.

16 --- (Panel withdraws)

17 MR. CASSIDY: We are adjourned until
18 Monday at 10:00 a.m., Madam Chair?

19 MADAM CHAIR: Yes, 10:00 until 5:00 on
20 Monday.

21 MR. CASSIDY: All right. And Mr. Cosman
22 has indicated that they are ready to proceed with Panel
23 10 at that time.

24 MADAM CHAIR: Yes. And please express
25 the Board's appreciation to the witnesses of Panel 10

1 who came to Toronto and then left again.

2 MR. CASSIDY: Madam Chair, just one
3 final -- I will, but just one final matter. I remain,
4 and it may be just me, I remain somewhat confused by
5 the schedule for the open houses, I'm sorry.

6 MADAM CHAIR: If you're confused everyone
7 is confused, Mr. Cassidy.

8 MR. CASSIDY: I try my best to keep these
9 things clear, but the schedule for the satellite
10 hearings, am I correct that the schedule that was
11 enumerated in your order remains in effect with the
12 exception of Red Lake which has been postponed to an
13 indeterminant time; is that correct?

14 MADAM CHAIR: That's right.

15 MR. CASSIDY: All right. Thank you.

16 MADAM CHAIR: Ms. Devaul, back
17 permitting, will be in Toronto next week and I will
18 have her send out a letter to the parties clarifying
19 that nothing has changed except the Red Lake satellite
20 hearing has been deferred to some unknown future date.

21 MR. CASSIDY: Thank you very much.

22 MADAM CHAIR: Thank you.

23 ---Whereupon the hearing adjourned at 3:45 p.m., to be
24 reconvened on Monday, June 25th, 1990, commencing
at 10:00 a.m.

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